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An analysis of the feasibility and benefits of standardizing the management of flight safety critical parts within the Department of Defense

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THESIS

AN ANALYSIS OF THE FEASIBILITY AND BENEFITS OF STANDARDIZING THE MANAGEMENT OF FLIGHT SAFETY CRITICAL PARTS WITHIN THE DEPARTMENT OF DEFENSE

by

Alvin L. Cooper

December 2001

Thesis Advisor: Donald R. Eaton
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13. ABSTRACT ***(maximum 200 words)***

Flight Safety Critical Parts (FSCP) are parts that if they fail will cause loss of aircraft and possible loss of life. Each Service within DOD has their own practices and procedures for management, acquisition, and categorizing of FSCP, e.g., Flight Safety Parts, Flight Safety Critical Items, Flight Safety Critical Parts, Critical Safety Items, etc. Due to the diversity between Services, there is significant confusion within DOD and private industry regarding the acquisition, management, and disposal of FSCP. Many of the parts identified as FSCP are used on aircraft operated by more than one Service and on civilian aircraft. The Defense Logistics Agency (DLA) manages parts that are common between Services, which include many FSCPs. Management for FSCP that cross component lines, with each Service providing unique specification, is very difficult. Identification, procurement, testing, and management of Flight Safety Parts need to be consistent between Services in order to provide one standard and one face to industry. Standardization of policies and procedures will increase the potential for the procurement of safe reliable FSCP and decrease the risk of selling faulty surplus FSCP to private industry.

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AN ANALYSIS OF THE FEASIBILITY AND BENEFITS OF STANDARDIZING THE MANAGEMENT OF FLIGHT SAFETY CRITICAL PARTS WITHIN THE DEPARTMENT OF DEFENSE

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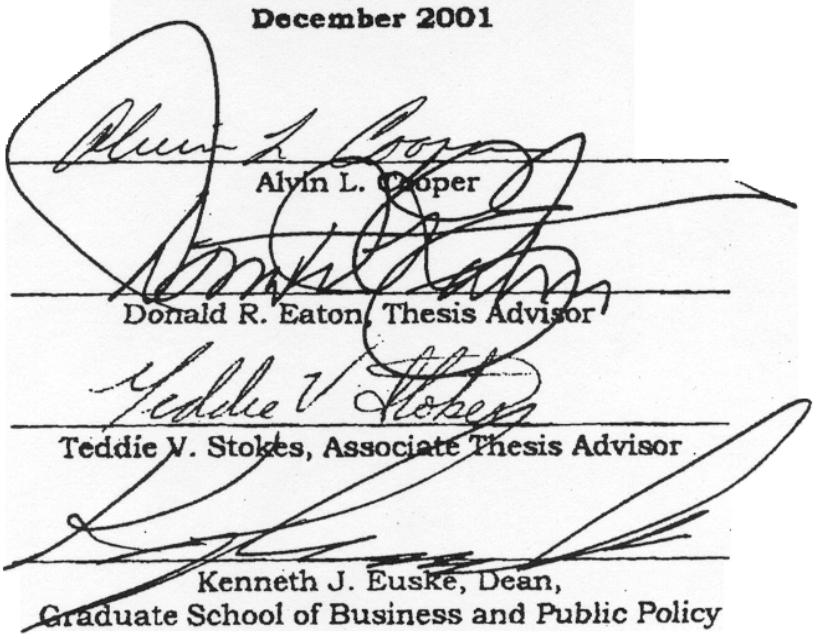

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ABSTRACT

Flight Safety Critical Parts (FSCP) are parts that if they fail will cause loss of aircraft and possible loss of life. Each Service within DOD has their own practices and procedures for management, acquisition, and categorizing of FSCP, e.g., Flight Safety Parts, Flight Safety Critical Items, Flight Safety Critical Parts, Critical Safety Items, etc. Due to the diversity between Services, there is significant confusion within DOD and private industry regarding the acquisition, management, and disposal of FSCP. Many of the parts identified as FSCP are used on aircraft operated by more than one Service and on civilian aircraft. The Defense Logistics Agency (DLA) manages parts that are common between Services, which include many FSCPs. Management for FSCP that cross component lines, with each Service providing unique specification, is very difficult. Identification, procurement, testing, and management of Flight Safety Parts need to be consistent between Services in order to provide one standard and one face to industry. Standardization of policies and procedures will increase the potential for the procurement of safe reliable FSCP and decrease the risk of selling faulty surplus FSCP to private industry.

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LIST OF ACRONYMS

AT&L	Acquisition, Technology, and Logistics
AFTO	Air Force Technical Order
AIS	Automation Information System
AMCOM	U.S. Army Aviation and Missile Command
AMRDEC	Aviation and Missile Research, Development, and Engineering Center
ASQ	Alternate Source Qualification
ATCOM	U.S. Army Aviation and Troop Command
BDE	Basic Design Engineer
CCB	Contractor Configuration Control Board
CH	Cargo Helicopter
CINC	Commander In Chief
CICA	Competition In Contracting Act
CIT	Consumable Item Transfer
CAI	Critical Application Item
DA	Department of the Army
DLA	Defense Logistics Agency
DOD	Department of Defense
DODI	Department of Defense Instruction
DODISS	DOD Index of Specifications and Standards
DOT	Department of Transportation
DRMO	Defense Reutilization Management Office
DSP	Defense Standardization Program
DCP	Durability Critical Part
EC	Essentiality Code
EFSCP	Engine Flight Safety Critical Part
ESA	Engineering Support Activity

FAA	Federal Aviation Administration
FAR	Federal Acquisition Regulation
FAT	First Article Test
FLIS	Federal Logistics Information System
FMECA	Failure Modes Effects Criticality Analysis
FSC	Flight Safety Critical
FSPs	Flight Safety Parts
FSCAP	Flight Safety Critical Aircraft Part
FSCP	Flight Safety Critical Parts
GAO	General Accounting Office
IAW	in accordance with
ICP	Inventory Control Point
IGW	Indiana Gear Works
IMPAC	International Merchant Purchase Authorization Card
JACG	Joint Aeronautical Commanders Group
JPCC	Joint Propulsion Coordinating Committee
LSAR	Logistics Support Analysis Record
M&O	Maintenance and Overhaul
MDAP	Major Defense Acquisition Programs
MilHdbks	Military Handbooks
MilSpecs	Military Specifications
MilStds	Military Standards
MNS	Mission Need Statement
NAVICP-P	Navy Inventory Control Point, Pennsylvania
NAVAVNDEPOT	Navy Aviation Depot
NGS	Non-Government Standard
NSN	National Stock Number
OEM	Original Equipment Manufacturer
ORD	Operational Requirements Document
OSD	Office Secretary of Defense

PAH	Production Approval Holder
PAT	Process Action Team
PICA	Primary Inventory Control Activities
PL	Public Law
POM	Program Objective Memorandum
PVA	Product Verification Audit
QDR	Quality Deficiency Reports
QE Std. 1	Quality Engineering Standard 1
QE Std. 2	Quality Engineering Standard 2
SIOP	Supplier Interface and Oversight Program
SOO	Statement of Objectives
SOW	Statement of Work
SPO	Special Projects Office
SRA	Source Approval Request
SSRA	System Safety Risk Assessment
STDP	Spare Technical Data Package
SUP	Suspected Unapproved Part
TBO	Time Before Overhaul
TIR	Total Item Record
UH	Utility Helicopter
USC	United States Code
USD	Under Secretary of Defense
USS	United States Ship
VCSA	Vice-Chief of Staff of the Army

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I. INTRODUCTION

A. PURPOSE

Flight Safety Critical Parts (FSCP) are parts that if they fail will cause loss of aircraft and possible loss of life. Each Service within the Department of Defense (DOD), i.e., Army, Air Force, and Navy, has a different way of looking at and managing FSCP. The Defense Logistics Agency (DLA) manages most of the consumable and repair parts for DOD, and many FSCP are common among Services. Each Service provides unique criteria and standards for managing FSCP based upon mission and operating environment. The burden on DLA to provide FSCP meeting different engineering characteristics is extensive. The purpose of this study is to analyze how each Service within DOD manages, i.e., acquires, sustains, disposes, FSCP and to examine/study the feasibility of developing standard practices and procedures for the acquisition, identification, documentation, and disposal of FSCP within DOD. Suggested title for the research is "An Analysis of the Feasibility and Benefits of Standardizing the Management of Flight Safety Critical Parts within DOD".

B. BACKGROUND

Proper management of FSCP is vital to prevent loss of life and property, and to ensure the military mission is accomplished as planned. If FSCP are not properly managed, i.e., identified, maintained, and tested, they could fail prematurely and any failure could be catastrophic. Each Service within DOD has their own unique practices and procedures for the management and acquisition of FSCP. Along with distinct practices and procedures, each Service has their own method of

categorizing FSCP, e.g., Flight Safety Parts, Flight Safety Critical Items, Flight Safety Critical Parts, Critical Safety Part, etc. Due to this diversity between Services, there is significant confusion within the Government and private industry regarding the acquisition, management, and disposal of FSCP.

DLA manages a large portion of the FSCP for DOD. Many of the parts identified as FSCP are used on aircraft operated by more than one Service and on civilian aircraft. Management for FSCP that cross component lines is difficult enough without each Service providing differing engineering procedures. In-order-to provide consistent management procedures to DLA and avoid providing conflicting information to private industry, manufacturer qualification requirements and testing procedures for parts designated FSCP need to be standardized and controlled.

Life cycle management of FSCP goes beyond manufacturing and testing of FSCP. The policies and procedures for the disposal of FSCP fall within the sphere of management and needs to be included in the standardized policies and procedures. The lack of standard documentation and loose compliance of disposal policies and procedures has resulted in the sale of out of tolerance FSCP to private aircraft vendors, and some of these out of tolerance FSCP have been sold back to DOD as good parts.

Standardization of policies and procedures will eliminate confusion in the acquisition, identification, documentation, and disposal of FSCP. Standardization of the acquisition of FSCP within DOD will reduce the

risk of nonconforming parts[1,2] entering the military inventory. The driving forcer for standardization of FSCP within DOD is the reduction of the risk of procuring, and releasing[3], nonconforming parts that are critical to safe flight. The benefits to keeping parts out of the supply system include enhanced safety and reduced sustainment cost. When nonconforming parts enter the inventory, there is the inherent risk of a mishap. Besides the cost of a mishap, there are underlying costs associated with identification, tracking, and purging the nonconforming parts from the supply system, and fielded aircraft. With the formation of DLA, the military is progressing toward a common DOD supply system. Standardization of FSCP will also reduce the cost of management[4], sustainment, and lifecycle logistics cost.

Standardization will eliminate multiple unique procurement requirements[5], thus providing a more efficient inventory within DOD. An inventory whose parts are made to one set of standards and requirements will produce stable parts, and reduce life-cycle cost. The result of continually changing the manufacturing process to meet varying engineering requirements is parts with varying tolerances and/or nonconforming parts. Changing engineering requirements to meet the demands of each Service results in expending unnecessary resources, time, and personnel, and will increase the probability of procuring nonconforming parts.

[1] Nonconforming parts are parts that do not meet the tolerances or specification of the technical documentation or engineering drawings for the part.
[2] Both new parts procured from manufactures of aircraft parts and surplus parts purchased from aircraft parts vendors.
[3] Releasing parts to the supply systems to be issued to field units, and the release of aircraft parts to the DRMO for release to private industry.
[4] The cost of managing parts includes resources expended, time, and personnel.
[5] Unique procurement requirements are stand alone engineering requirements from each Service based upon their individual mission and operating environment.

This study will be based upon current policies and procedures used by each Service. Information will be gathered through literature search of current regulations, attending meetings dealing with flight safety issues, and interviewing key personnel who are actively involved in FSCP decision making.

C. RESEARCH QUESTIONS

1. Primary Research Question

What are the commonalities and differences in the procedures used by each Service to acquire, identify, qualify, and control FSCP, and how can the procedures be standardized to ensure ample control of FSCP collectively across all the Services within DOD?

2. Subsidiary Research Questions

A. What is the DOD definition and policy for FSCP, and is this policy adequate to ensure safe aircraft parts?

B. How do the military Services implement the DOD FSCP policy?

C. How do the military Services identify, document, and control FSCAP?

D. How are FSCP manufacturers qualified and parts tested by each Service?

E. What procedures are used to retire and dispose of FSCP by each Service?

F. How does the FAA interface with the FSCAP program?

G. What effect will standard DOD FSCP practices and procedures have on the FAA?

D. SCOPE OF THESIS

The results of this study will be executable recommendations for the management of FSCPs. This study will be limited to the DOD Services, i.e., Army, Air Force, and Navy (Marines are part of the Department of the Navy and any unique requirements for the Marines will be addressed under the Navy policy), and to the procedures for acquisition, classification, documentation, and disposal of FSCP. This study will address coordination and agreements with the Federal Aviation Administration (FAA) for the disposal of surplus military aviation parts and the impact of nonconforming parts on civil aviation. This study will not include private industry or civilian FSCP requirements nor will it include generic maintenance or supply system problems.

E. METHODOLOGY

This research will consist of two methods, a literature search and interviews with key personnel. Literature search will consist of researching publications, technical manuals, regulations, directives, and Standard Operating Procedures (SOPs) for each of the DOD Services. Literature search will also consist of General Accounting Office (GAO) reports and commercial studies. In addition, research will consist of attending meetings and seminars on flight safety, and interviews with key personnel and managers of the different Services. Interviews will be structured to gather empirical data so that the data can be analyzed without bias of personal opinion. Analysis of the findings from the literature search, meetings, and personal interviews will be compiled and sorted by similarities and differences to establish a matrix to propose a hypothesis for a recommendation.

F. ORGANIZATION

1. Chapter I - Introduction

This chapter will provide an introduction of Flight Safety Critical Parts, and provide the basis for this thesis.

2. Chapter II - History

This chapter will provide a discussion of the events leading to the need for a unified procedure for the acquisition, maintenance, and disposal of FSCP.

3. Chapter III - Presentation Of Data

This chapter will document the research on flight safety parts and support the analysis and conclusions reached. This chapter will cover management responsibilities of flight safety parts from DOD down to the Service level, and cover the entire lifecycle of flight parts. This chapter will start with the basic definition and procurement policy and end with the disposal of flight safety parts.

4. Chapter IV - Data Analysis

This chapter analyses the data presented in Chapter III.

5. Chapter V - Conclusions and Recommendations

This chapter will document the conclusions reached, and provide recommendations to improve the DOD FSCP program.

G. BENEFITS OF THE STUDY

This research could lay the groundwork for the standardization of procedures for acquisition, identification, documentation, and disposal of FSCP within DOD. DLA manages most repair and consumable parts for the Services. Each Service has unique engineering requirements for the procurement of FSCPs, and each Service wants DLA managed FSCP procured to their individual requirements. Standard procedures will eliminate conflicting procedures between Services. It is difficult to manage parts and maintain an adequate supply chain with multiple conflicting requirements on the same part. An example of this is if more than one Service uses a particular part, then each Service may have unique requirements, which are distinctively different, i.e., the Navy may require corrosion prevention due to operating in a saltwater environment, while the Army may need protection from sand erosion. The differences between operating conditions may require different engineering procedures. When DLA goes to replenish the stock of these parts as they are consumed, which requirement do they buy from, or do they buy for both requirements and establish a procedure to track the parts based on the requirement. Tracking the different requirements could be difficult if one National Stock Number (NSN) is used. Another benefit of this study is the standardization of documentation across DOD. Standardization of documentation will provide a method for accurately tracking parts by location and total time across Service lines thus reducing the likelihood that an expended FSCP will be returned to the military supply system or sold to private industry as a good part. Life-cycle logistics cost savings will be a significant benefit as well as safety improvements.

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II. HISTORY

Parts critical to the safe operation of aircraft have been around since the first aircraft flew in 1903 at Kitty Hawk, North Carolina. The Army recognized parts critical to the safe operation of aircraft in the mid 1960's when the use of helicopters escalated in the Viet Nam war. During the 1970's, the Army undertook many engineering initiatives to improve reliability and increase the life of aircraft parts. Engineering initiatives that focused on parts critical to safe operation of the aircraft evolved into the Prime Manufacturing Critical Parts Program for a limited number of parts in sensitive processes. In 1985, parts critical to safe operation of the aircraft were labeled as Flight Safety Parts (FSP).

In 1984, Congress passed the Competition In Contracting Act (CICA), which directed the Department of Defense (DOD) to competitively procure all its resources in order to provide small and disadvantaged businesses access to lucrative defense contracts. The intent of CICA was to stimulate the economy, increase the number of small and disadvantaged businesses producing parts for the military, and provide a new source of suppliers at a reduced price. Prior to 1984, the majority of aircraft parts were bought from the aircraft manufacturer. After 1984, due to CICA, the Army issued numerous contracts to acquire technical documentation from the Prime Manufacturer/Original Equipment Manufacturer (OEM) in order to build competitive Spare Technical Data Packages (STDPs) for the breakout of spare parts; FSP were not included in this effort. The Army developed competitive FSP STDPs in-house and, by 1987, the Army started competitive procurement of FSPs. The Air Force and Navy did not breakout FSPs. They developed Service unique Justification and Approval (J&A) documents for the sole source

procurement of FSPs. From 1985-1988, the Army used in-house technical documentation and prime contractor sustainment engineering to identify and verify critical characteristics in order to develop engineering testing requirements, i.e., fatigue, endurance, and interchangeability for FSPs. In 1990, the procurement of spare parts to support Desert Shield/Storm was accelerated and by necessity Army FSPs were procured from untested sources. Along with this huge influx of parts to support the Gulf Crisis, the Army inventory acquired numerous suspect parts.

Indiana Gear Works (IGW) Inc. is a typical example of problems that can occur with parts purchased from an untested source. From 1986 through 1989, the Army bought Apache main transmission gears from IGW Inc. The gears were not properly hardened in the manufacturing process. Over the three-year period, there were numerous Quality Deficiency Reports (QDRs) written against the main transmission. An engineering investigation of the QDRs revealed the fault to be improperly hardened gears. As Apache main transmissions with IGW gears were overhauled, IGW gears were replaced and removed from the supply system.

In the spring of 1985, there were two Class A mishaps resulting in total loss of a UH-60 and a CH-47 aircraft. In both cases, the accident investigations determined prime manufacturer material defects were the cause of the mishaps. As a result of the accident investigation findings in 1985, the Vice-Chief of Staff of the Army (VCSA) directed testing of in-service parts (surveillance testing) and life cycle documentation control.

In-service Parts (Surveillance) Testing is the testing and evaluation of used FSP in the inventory, i.e., parts in depot overhaul lines, depot stock, and parts on fielded aircraft. The FSP are selected for surveillance testing on the basis of lifetime limits/Time Before Overhaul (TBO), operational mission/environment, and configuration. The types of testing performed were fatigue, endurance and interchangeability, analytical tear down, and non-destructive evaluation.

Life cycle documentation control includes identification of FSPs and their critical characteristics in technical information, drawing revisions, technical data package enhancement, and field/depot maintenance manuals.

Throughout history, there have been disasters that were the direct result of a critical part or application failure. Although the following examples are not directly related to aviation, they depict the results of poor quality in either materiel or installation, which is at the heart of the FSP program. Over looking critical characteristics can be disastrous. In 1905, the boiler on the USS Bennington, a U.S. Navy Gunship, exploded killing 62 people. The USS Bennington exploded due to a faulty safety valve. There is no record or direct evidence that the safety-valves on the USS Bennington had been tested in accordance with (IAW) Navy Regulations. [Ref. 2:USS Bennington] On 11 April 1912, the Titanic sank after hitting an iceberg, 1522 people, passengers and crew, were lost at sea. When the Titanic struck the iceberg, the steel plates in the hull cracked like glass due to improper hardening of the steel. [Ref. 2:Titanic] In 1963, the USS Thresher, a U.S. Navy Submarine, sank killing the crew of 129 along with the overhaul engineering staff. The USS Thresher sank due to a water line break in the main engine room. After the water line

broke, the surrounding bulkheads cracked due to faulty welding performed during a recent overhaul. Investigation determined that existing standards at the time were not followed throughout the overhaul to ensure safe operation of the submarine. [Ref. 2:USS Thresher] In 1987, the Space Shuttle USS Challenger exploded 73 seconds after launch, killing the crew of seven. A faulty O-ring in the solid fuel rocket booster was identified as the principal problem. The "O" ring design was unacceptably sensitive to a number of factors. These factors were the effects of temperature, physical dimensions, characteristics of the materials, effects of reusability, processing, and reaction of the joint to dynamic loading." [Ref. 3:p 41-68] The booster joint and "O" ring design were not robust enough to compensate for the managerial decision to launch the shuttle outside of its operational temperature envelope (the air temperature was near freezing on an "atypical Florida day", not an anticipated design criteria)." [Ref. 3: p. 41-68]

In September 1988, Congress passed Public Law 100-456 (10USC Sec 2382) "Procurement of critical aircraft and ship spare parts: quality control." Public Law 104-106 repealed 10USC Sec 2382 in October 1994. Public Law 100-456 directed the Secretary of Defense to enforce standards of quality control in the procurement of all critical aircraft and ship spare or repair parts. The House Bill contained a provision (sec 808) that would require the Secretary of Defense to procure critical spare or repair parts for ships and aircraft that meet the same quality and inspection requirements as the original parts. [Ref. 4:p 2555] The Senate amendment contained a provision (sec 822) that would require the Secretary of Defense to use, in procuring critical spare or repair part for aircraft, qualification requirements that were at least as stringent as those that applied to the original or original redesigned parts. [Ref 4:p 2555] The House and Senate compromised to produce an amendment

with broad implications and one in which CICA still applied. The final amendment required the head of an agency, when purchasing critical spare parts or repair parts, to use all appropriate qualification and quality requirements as may be specified and made available to potential offerors. [Ref 4:p 2555]. The House and Senate both wanted to restrict FSP to the same standards as Original Equipment Manufacturer (OEM) parts. In keeping with the intent of CICA, and not eliminating competition, the House and Senate compromised on the broad wording for the law. The broad wording of the law put the responsibility of implementation on DOD. The challenge for DOD was to implement the law without violating the intent of CICA. Based upon final wording of the bill, each Service developed implementation instructions for the processing and handling of FSP. Each Service's implementation plan was unique and was based on the Service's culture and way of doing business. There are differences in the culture, philosophy, engineering procedures, and business rules for the three Services. The Army operates in a variety of field environments from dry hot desert to hot humid rainforest to arctic conditions. The Navy operates on aircraft carriers, in a saltwater environment, and must land and stop within the distance of a football field. The Air Force operates from fixed bases with mile long landing strips. Based on the loose wording of PL 100-456 and the distinct cultures of the three Services, there are three different philosophies for managing FSP. The Army maintained its FSP policy and embraced CICA with an obsessive desire to obtain breakout goals. The Air Force and Navy developed several categories of FSP, Flight Safety Critical Parts (FSCP) being the most stringent. The Air Force and Navy wrote a class action waiver to exempt themselves from the requirements of CICA for FSCP.

The National Defense Authorization Act For Fiscal Year 1996, Title VIII: Acquisition Policy, Acquisition Management, and Related Matters – Subtitle A: Acquisition Reform; Sec 803 "Control in Procurements of Critical Aircraft and Ship Parts" repealed Section 2383 of Title 10, United States Code (PL 100-456). [Ref. 5] The National Defense Authorization Act For Fiscal Year 1996 became PL 104-106 on 10 Feb 1996. The repeal of PL 100-456 was part of the on going acquisition reform initiative to reduce the use of Government specifications and standards. The PL 104-106 removed the mandatory enforcement of quality standards, but there were no changes in the current practices or procedures specified; therefore, there were no noticeable changes in the philosophy of the management of FSP. The Navy Alternate Source Qualification (ASQ) Desktop Guide, 7 Apr 99, still references PL 100-456 as a requirement to purchase FSP to the same quality standards as the OEM.

In 1988, problems with the Army breakout program began to surface. One example of a breakout problem was in 1988 when it was discovered that a UH-60 parts breakout contractor was producing substandard parts. An investigation of the cause revealed that the Technical Data Package (TDP) used in the solicitation and contract did not produce the same part that was produced by the OEM. The original part experienced several years of fine-tuning and minuscule adjustments to the manufacturing process, which was not captured in the Technical Data Package. Constant adjustments to the manufacturing process by the OEM produced a superior part. Although still within the parameters of the drawings, the part was substantially different from one that was manufactured solely from the information contained in the TDP.

The Army began testing and qualifying manufacturers and vendors for new sources of FSP on a limited basis in 1989. New source testing was established to verify that parts from all sources meet the critical characteristic[6] requirements of the FSP. Due to the success of the program, a full-up program was initiated in 1993. To qualify new FSP sources, the Army uses the OEM, commercial testing houses, or DOD laboratories to perform qualification testing on parts. Parts not meeting testing requirements are not used.

One problem encountered by the Army when qualifying new sources was quality standards among manufacturers were not standard. Prime contractors had a quality program, but breakout vendors had minimal quality standards and none of them used the same quality procedures. In order to standardize quality procedures and institutionalize quality standards for FSPs, Quality Engineering Standard 1 (QE Std 1) was developed in 1989 for the manufacturing of new flight safety parts. QE Std 1 applies to all breakout buys with parts that have manufacturing critical characteristics and is a mandatory contractual requirement for breakout manufactures, contractors, and sub-contractors. Critical processes performed during maintenance, overhaul, and repair of FSP are just as critical and important as new manufacturing. Quality Engineering Standard 1 does not apply to Maintenance and Overhaul (M&O) procedures.

[6] **Critical Characteristic.** Any feature throughout the life cycle of a FSCAP, such as dimension, tolerance, finish, material or assembly, manufacturing or inspection process, operation, field maintenance, or depot overhaul requirement that if non conforming, missing**,** or degraded may cause the failure or malfunction of the FSCAP. [Ref. 6:a 16.41.1]
Manufacturing Critical Characteristics. Critical characteristics produced during the manufacturing process. [Ref. 6:a 16.41.2]
Installation Critical Characteristics. Critical characteristics that are not introduced during the manufacture of a part, but are critical in terms of assembly and/or installation, e.g., proper torque. [Ref. 6:a16.41.3]

In the early 90s, there was limited surveillance of contractors performing maintenance, overhaul, and repair on FSP. As the number of FSP repaired by contractors began to increase, the need for an M&O quality standard became evident. The quality requirements of FSP M&O contractors were consistent with the quality requirements of manufactures of new FSP. As the FSP program evolved, Quality Engineering Standard 1 was applied to M&O contractors. In applying QE Std 1 to M&O contracts, it became apparent that M&O practices and procedures were incompatible with manufacturing process and needed a separate unique quality standard. In 1991, Quality Engineering Standard 2 (QE Std 2) was developed for M&O contracts. QE Std 2 is applicable to all M&O repair procedures for FSP with depot[7] critical characteristics, and applies to all contractors[8] and repair facilities that perform maintenance on FSP.

In 1992, the FAA[9] investigated the crash of a civilian airliner. The accident investigation revealed used Air Force T-39 aircraft parts had been sold to private industry and were installed on the civilian airliner. [Ref. 10] After this incident the FAA has found instances where DOD aircraft parts, sold as scrap, illegally reentered the civil aviation market as usable. [Ref. 8:p 3]

Due to technological advances and the similarity of aircraft, some military aircraft parts can be used on commercial aircraft. Parts that are interchangeable between military aircraft and commercial aircraft are considered commercial-type parts[10]. The FAA considers DOD

[7] i.e, Manufacturing and Installation critical characteristics.
[8] Both government and private activities.
[9] The FAA was created as an agency under the Federal Aviation Act of 1958 to provide for regulation and promotion of civil aviation in such a manner as to best foster its development and safety, and provide for the safe and efficient use of the airspace by both civil and military aircraft an for other purposes. [Ref. 11]
[10] Commercial-type parts have application to aircraft used in civil aviation. [Ref. 8:p 2]

commercial-type parts to be dual use parts [11] when the supplier is also Production Approval Holder (PAH) approved by the FAA. The Federal Property and Administrative Services Act of 1949 (PL 81-152), as amended, requires DOD to dispose of surplus property; however, DOD is prevented from destroying property with economic value. Consequently, since the end of World War II various U.S. manufactured DOD surplus military aircraft and parts have been available for sale to the civil sector. [Ref. 7:p 3] Since the implementation of PL 81-152 the disposal of surplus aircraft parts has evolved into a complex disposal system that is characterized by massive volumes of excess property. DOD's primary disposal objective is to maximize the reuse of surplus property within the military Services, various Government agencies, and authorized donees before offering the property for sale to the general public. Despite this goal, DOD actually sells most of its surplus property to the general public. [Ref. 8:p 3] All parts used in civil aviation are required to be certified by the FAA[12]. While many military parts are commercial-type parts, they are not generally FAA certified because DOD specifies requirements for the design, production, and acquisition of parts used on military aircraft that may be inconsistent with FAA specifications. Many DOD commercial-type parts have the potential to be retroactively certified once the parts have been determined to conform to the FAA-approved design and manufacturing processes. [Ref 8:p 2]

Historical data are required to gain FAA certification of surplus aircraft parts. When surplus aircraft parts are sent to the Defense Reutilization Management Office (DRMO) historical data are often

[11] Dual Use Product/Part. Any product or part manufactured for civil application by PAH authorized by the FAA, which is also procured under U. S. military contract. The product or part has the identical part number and configuration as its civil counterpart; it was manufactured using the same FAA-approved design, materials, and manufacturing processes. These could also include any product (or part thereof) originally produced for the military, which currently holds a normal, utility, acrobatic, or transport type certificate (TC) issued under section 21.27. [Ref. 7:p 2]

[12] The design for the part and the manufacturer's production process met FAA's approval

misplaced, or is never received with the part[13]. [Ref. 8:p 20] From January 1993 through December 1994, the GAO studied how DOD markets and sells surplus and scrap aircraft parts to the general public. [Ref. 8:p 1] The GAO found in spite of incomplete or missing documentation, parts that exceeded their life expectancy or those out of tolerance were sold in the same batch and under the same conditions as new or serviceable parts. The GAO also found that some aircraft parts dealers and vendors who bought excess military parts would refurbish and clean up the scrap parts and sell them as usable aircraft parts[14,15].

The GAO found unlike some progressive commercial companies, DOD does not have the procedures to prevent the improper use of scrap once it is sold. Also, DOD does not mutilate or destroy many of the flight-critical scrap parts that it sells and does not require the buyer to warrant or certify that all scrap purchased will be used only as such. [Ref. 8:p 3]. The GAO also found that the DOD disposal staff is not required to identify parts that are FAA certified or have the potential to be retroactively certified by the buyer. DOD disposal staff leaves it up to the buyer to determine whether a part is certified or can be made so retroactively. [Ref 8:p 8]

Due to the 1993 - 1994 GAO study[16], concerns internal to DOD for the appropriateness of sale and condition of items at the time of sale rose with the publication of the new DOD regulation 4140.1R, DOD materiel Management Regulation. Because of these concerns, Deputy Under

[13] Timed out parts are required to be mutilated per policy, TM 738-751.
[14] Usable aircraft parts are those that have value greater than their basic material content and have potential to be used for the originally intended purpose. [Ref. 8:p 1]
[15] According to officials from FAA and the Department of Transportation's Office of Inspector General, financial motives can lead unscrupulous individuals to illegally refurbish or clean up DOD scrap aircraft parts and pass them off in the civil aviation market as usable. [Ref. 8:p 12]
[16] The 1993 GAO study resulted in GAO report, Commercial Practices-Opportunities Exist to Enhance DOD's Sales of Surplus Aircraft Parts, Report number GAO/NSIAD-94-189, September 1994.

Secretary of Defense (Logistics) convened a meeting hosted by DLA on 13 September 1994.

As a result of the Disposal Meeting of 13 September 1994, the Deputy Under Secretary of Defense (Logistics) formed a Process Action Team (PAT) to be co-chaired by DOD and the FAA to study Flight Safety Critical Aircraft Parts (FSCAP). The FSCAP PAT was formally charted and began work 7 December 1994. The FSCAP PAT by charter reviewed the following:

1. Process for identification of dual use FSCAP.

2. Appropriate documentation required to accompany all FSP at time of disposal/sale from DOD inventory.

3. Coding structure necessary to ensure that parts lacking appropriate documentation, because of configuration or condition, are identified and mutilated prior to disposal.

4. Method of ensuring interservice and interagency sharing of information relevant to sale of parts.

5. Method to require recipients as a condition of transfer, donation, or sale of subject FSCAP to inspect, repair, and/or overhaul the FSCAP to FAA requirements prior to subsequent transfer. [Ref. 9:p 1]

The charter of the FSCAP PAT appears to be all encompassing; however, the PAT did not cover the life cycle management of FSP. The FSCAP PAT did not cover the procurement and upfront engineering required to obtain high quality FSP. The FSCAP PAT concentrated on disposal of FSP and increasing the revenue from the sale of FSP. Due to political pressure, a good deal of the PAT's effort was consumed with defining required historical data and sources available for historical data

reconstruction. The FSCAP PAT recommended that FSCAP that exceed their life expectancy, or do not have proper historical documentation must be mutilated, and that a section be added to DOD 4140.1R to implement a DOD FSCAP program.

In July 1995, DOD initiated a department wide Flight Safety Critical Aircraft Parts Program to identify and destroy surplus parts that could cause an aircraft to crash if the parts failed during a flight. The goal of the program is to prevent potentially dangerous parts form being sold by the DRMOs. [Ref. 1:p 3]

Due to the GAO study, the sale of surplus aircraft parts, and the potential sale of unserviceable parts as serviceable, received a lot of visibility. On June 25, 1993, the Commandant of the United States Coast Guard directed that a one-time inspection of all inventories of FSCAP be performed. He also directed the installation of appropriate recurrent procedures to guard against future acquisition of "bogus parts." [Ref. 12:p 12]

In 1993, the U.S. Army Aviation and Troop Command (ATCOM) implemented a policy for FSP, requiring purchase from OEM only. After 3 months, the policy was rescinded due to numerous GAO protest from potential bidders that were excluded from bidding on FSP. [Ref. 13]

In January 1996, ATCOM developed and coordinated with the Department of the Army (DA) a FSP policy that was CICA friendly. The new Army FSP policy stated;

> The Army's policy is to acquire high quality, proven, reliable, and safe flight safety parts. Flight safety parts which require engineering testing (Fatigue, Endurance, Interchangeability) shall be procured only from sources whose part has met engineering test requirements. [Ref. 21]

Each Service has established rules for the qualification of manufacturers and vendors of FSP. In 1997, the Army instituted the Supplier Interface and Oversight Program (SIOP) and Flight Safety Parts Program. Through these processes the Army continuously performs surveillance visits and quality inspections of contractors' facilities, routinely monitors contractor performance, and performs conformance inspections and audits. This process reviews frozen process planning, assures compliance with FSP program requirements, documents findings and issues, and establishes dialog with manufacturers regarding FSP program and program requirements. The Navy has a 3-year rule, if a vendor has not produced a part in 3 years, they must be requalified. The Air Force has several layers of FSP, i.e., Flight Safety Critical (FSC), Durability Critical Part (DCP), Critical Application Item (CAI) with FSC being the most critical, and CAI the least critical. Air Force approval for qualification of manufacturers and vendors is limited to: 2 years for FSC, 3 years for DCP, and 5 years for CAI. The Defense Standardization Program requires validation of qualified sources every 2 years.

During the 1980s, Congress was becoming concerned about the growing U.S. budget. The workforce was getting older and there was a bow wave of baby boomers becoming eligible for retirement. Analysis and studies of the aging workforce and the effect of a large number of workers eligible for retirement encouraged Congress to start looking for ways to decrease the burden the increasing number of retirees would put on the already stressed U.S. financial system. In order to reduce the

financial burden, Congress started looking for ways to streamline the Government and reduce duplication of effort. In the 1980s, a number of bases were closed and Government agencies combined to eliminate duplication and decrease the number of personnel in the Government. Each Service within DOD managed parts for their weapon systems. There were a lot of parts that were common across the Services. As part of the elimination of duplication effort, DOD was directed to transfer all consumable items to DLA for management. The transfer of parts was performed in two phases, Consumable Item Transfer (CIT) I from 1991 – 1995, and CIT II from 1996- 1997. The overall responsibility for weapon systems readiness was a shared responsibility among the DLA Inventory Control Points (ICPs), Army/Navy/Air Force Primary Inventory Control Activities (PICAs), and military Services' engineering activities. This arrangement has increased the potential for miscommunication that results in bogus parts being procured. Due to the CIT DLA is now the PICA for procuring repair and consumable parts for DOD. DLA does not have the engineering authority, staff, or expertise required to maintain the technical data packages[17] for weapon systems items. Therefore, engineering responsibility for items used on aircraft and aircraft weapon systems has been retained by the responsible Service and its Engineering Support Activities (ESAs). Each Service has different business rules and engineering rules for managing their parts. It is difficult to manage parts and maintain an adequate supply chain with multiple conflicting requirements on the same part. When DLA buys new FSP, they review the Standard Automated Materiel Management System (SAMMS). If the SAMMS does not have the current Technical Data Package or configuration of the part, DLA ICPs send an Engineering Support Request DLA Form 339 to Service ESAs in order to obtain the current

[17] Technical data packages IAW Mil-Dtl-31000 would be a very precise method to convey the data from the Service Engineering Support Activity (ESA) to the DLA Inventory Control Points (ICPs). The Army already documents its engineering requirement in document called "Spares, Technical Data Package".

technical data package and qualified suppliers[18]. The management of FSP using three different engineering rules is a real problem that DLA is forced to deal with. DLA's rule of thumb is to use the most restrictive requirement as delineated by the operational mode summary and mission profile for the weapon systems using that item. In order to resolve this dilemma of miscommunication, the Services and DLA need a common set of definitions, standard engineering procedures for qualifying FSP, and most of all a standard method to communicate[19] the engineering requirements[20] to DLA PICAs and other PICA[21].

The control and management of FSP also affects the commercial sector. The Drug Enforcement Agency, other U.S. Government agencies, and foreign military sales customers use the OV-10, which is no longer in the Navy inventory. For continued support of the aircraft, DLA still buys parts and the Navy still provides engineering support and maintains/controls FSP critical characteristic.

On 8 March 2000, Representative Bill McCollum introduced H.R. 3862, Aircraft Safety Act of 2000. The "Aircraft Safety Act of 2000 – Amends the Federal criminal code to prohibit, and set penalties for, knowingly and with intent to defraud, in or affecting interstate or foreign commerce:

[18] The Defense Standardization Program (DSP) acknowledges that qualification is more than the DSP qualification program for Defense Specifications. The DSP qualification program already embarrasses qualification for federal spec and non-government standards, however the DSP has yet to include qualification in the form of source control and source approval within its documentation process.
[19] The supply and contracting functions must maintain close communication with the Service's engineering sustainment and cognizant design engineer. Communication among these functional team members is essential. DMRD-926 mandated all "DATA" be supplied by the Services to DLA for transferred items.
[20] Technical data packages IAW Mil-Dtl-31000 would be a very precise method to convey the data from the Service ESAs to the DLA ICPs. The Army already documents its engineering requirement in document called "Spares, Technical Data Package".
[21] For each weapon system, PICA responsibility is shared among all Services and DLA.

(1) Falsifying or concealing a material fact, making any materially fraudulent representation, or making or using any materially false writing, entry, certification, document, record, data plate, label, or electronic communication concerning any aircraft or space vehicle part;

(2) Exporting from or importing or introducing into the United States, selling, trading, installing on or in any aircraft or space vehicle any part using or by means of a fraudulent representation, document, record, clarification, depiction, data plate, label or electronic communication; or

(3) Attempting to, or conspiring to commit any such offense." [Ref. 14]

On 27 March 2000, the Aircraft Safety Act was referred to the House Subcommittee on Crime. As of 1 June 2001, the bill was pending final resolution. Prior to the introduction of the Aircraft Safety Act of 2000 there was no real penalty for destroying or altering the documentation on aircraft FSPs and selling bogus aircraft FSP as good reliable parts. The Aircraft Safety Act of 2000 provides the needed teeth to the FAA and other law enforcement agencies to enforce the documentation requirement for FSP.

Throughout the history of military aviation, there have been key events that increased the risk of inferior parts being installed on military aircraft:

- The Competition In Contracting Act of 1984
- The transfer of consumable parts from the Services to DLA in 1991 under DMRD-926
- Acquisition Reform, and
- Specs and Standards Reform.

Before CICA (prior to 1984), most aircraft parts were bought from the aircraft manufacture. After CICA, there was a large influx of manufacturers and vendors for aircraft parts. Some of the parts produced by the vendors were not up to the same standards as the original part. In 1989, the Army began testing and qualifying manufacturers and vendors for new sources of FSP. New source testing was established to verify that parts from all sources meet the critical characteristic requirements of the FSP. From 1993 to 2000, the military has invested $73 Million to qualify/re-qualify sources[22] of FSP.

Acquisition Reform (of the 5000 series) created administrative and management policy that perceptively[23] banned engineering practices in the form of Military Specifications (MilSpecs) and Military Standards (MilStds). In the early 1990's, management, financial, contracting and engineering practices and procedures were defined in directives, Program Objective Memorandum (POM) process, Federal Acquisition Regulation (FAR) and MilStds. MilStds that standardized the quality engineering practices to the entire acquisition and logistics community supplemented the 1990 version of DODI 5000.2. Today quality-engineering practices[24]

[22] "Qualification" 10 USC Sec. 2319. Encouragement of new competitors (a.k.a. CICA)
"(a) In this section, the term "qualification requirement" means a requirement for testing or other quality assurance demonstration that must be completed by an offeror before award of a contract." Qualification in this context includes source control, source approval and qualification (QPL) AMSC of B, C, and T. The DSP does not include source control and source approval ("B" or "C") as qualification mechanisms within the purview of the Defense Standardization Program. The DSP only acknowledges qualification requirement within its own defense specifications (MilSpecs). Thus no public document is available to identify qualified Source Control / Approval sources. [Ref. 15]

[23] Reality: Acquisition Reform discouraged the application of prescriptive management and manufacturing process standards and required waivers to use such standards, whether they are military, federal, or non-government. Today, there are:

433 military standard practices (none of which require a waiver),
31 military design criteria standards (waiver required),
112 interface standards (no waiver required),
10 military manufacturing standards (waiver required),
57 military test method standards (waiver required), and
101 of the old MilStds (waiver required).

[24] Navy nuclear requirements were exempted from Acquisition Reform .

must be found in other than DOD MilStds[25]. Substitute documents in the form of Military Handbooks (MilHdbks) provide only fundamental principles that would have to be re-written, by functional experts, into standards to be inserted in to Major Defense Acquisition Program's (MDAP) Mission Need Statement (MNS)/ Operational Requirements Document (ORD) / Statement Of Objectives (SOO) /Statement of Work (SOW) / Specifications.

The Specs and Standards Reform has resulted in the cancellation[26] of many MilSpecs and MilStds [Ref. 17]. The Military Departments and Defense Agencies have accomplished the Herculean task of reviewing and taking action on more than 29,000 military specifications and standards. The results:

- 9600 documents canceled, including 3500 that were replaced by non-government standards, performance specifications, commercial item descriptions, and guidance handbooks.
- 8100 documents were inactivated for new design and will be used only to support legacy systems and equipment.
- Essentially, all that remains of the document improvement effort is a few hundred military specifications and standards

[25] A notable exception is Mil-Std-882D, System Safety. Although much of the specific requirements has been moved to a non-mandatory appendix, DoD 5000.2R euphemistically directs the PM to use and require the contractor to use industry and DOD standard practice for system safety, consistent with mission requirements.
Safety and Health - The PM shall identify and evaluate safety and health hazards, define risk levels, and establish a program that manages the probability and severity of all hazards associated with development, use, and disposal of the system. The PM shall use and require contractors to use the industry and DoD standard practice for system safety, consistent with mission requirements. This standard practice manages risks encountered in the acquisition life cycle of systems, subsystems, equipment, and facilities. These risks include conditions that create significant risks of death, injury, acute/chronic illness, disability, and/or reduced job performance of personnel who produce, test, operate, maintain, support, or dispose of the system. [Ref. 16:para 5.2.10.3]

[26] Twenty-eight (28%) percent of the DODISS MilSpec are detailed specifications.

that may be replaced in the future if suitable non-government standards can be developed. [Ref. 18]

Application of MilSpecs is at the risk of the user, i.e., the weapon systems ESA or Special Projects Office (SPO) for FSCP. Special studies have related as many as 50% of a weapon system's parts to MilSpecs. Therefore, reform performance MilSpec Revision B may not be a drop-in replacement for the former design MilSpec Revision A. Thus, the ESA, as the application engineer, must do a side-by-side crosswalk matrix of the requirements in Rev A to the requirements in Rev B, and make his own decision as to the appropriateness of a reformed MilSpec as a drop-in replacement for each weapon system. The elimination of qualification requirements from some MilSpecs[27] have resulted in some FSCP and Flight Safety Standard Parts being procured from unapproved sources/unqualified sources. MilStds have been the source documents for quality engineering practices that have been used in administrative regulations to define quality-engineering practices, e.g., Army Regulation 750-1 dated Aug 1994 used MilStds to define the Army's "Component Safety Program".

The transfer of Engineering Defense Standardization Preparing Activity responsibility for defense specifications from the Army, Air Force, and Navy to DLA has resulted in breaking of the informal liaisons between the MilSpec preparing activity and weapon system cognizant design activity engineers. Funding and engineering support staff

[27] The Defense Standardization Program qualification policy was to intended to ensure compliance with DSP qualification procedures. The qualification requirements were deleted from specifications when there were zero (0) qualified sources or there was insufficient justification to retain qualification.
Deleting the qualification requirement changed the acquisition strategy from the restrictive "T" to open competition of "G". For FSCAP items this change understates the minimum acceptable requirements for the item, thus supplementation of the MilSpec is required in order to re-establish the minimum quality level for critical safety aircraft parts.

remains a challenge. Relationships between MilSpecs and NSNs to supported weapon system, for the most part, are not an automated capability. The MilSpec to NSN Automated information System (AIS) entity relationship does not exist at the DoDISS[28] and SAMMS /Total Item Record (TIR) levels. The Defenses Standardization Program (DSP) is not able to relate its documents (MilSpecs) to the NSNs, via an AIS primary key to foreign keys. Furthermore, when ESAs have not listed their interest in the DSP ASSIST-On-Line database, the MilSpec preparing activities have no way to know with whom to coordinate document revisions that involve items being used on weapon systems under the purview of the application engineers at the ESA or SPO. This communication link is left to the Service's DSP custodian. Consequently, the DSP Office has formed an IPT to improve the DSP coordinating process to meet the needs of a wider community. [Ref. 19] Aircraft programs must trade-off price, performance, schedule, and risk. As pressure increases on performance and price, greater levels of risk are allocated to sustainment engineering and readiness support needs required in the out years, e.g., the contractor logistics support concept for the B-2 has expired, therefore sustainment support of this low-density aircraft will become the responsibility of the Air Force.

[28] DoD Index of Specification and Standards (DODISS) a.k.a. Web Site "Assist-On-Line"

III. PRESENTATION OF DATA

This chapter will document the research on flight safety parts and support the analysis, and conclusions reached. This chapter will cover management responsibilities of flight safety parts from DOD down to the Service level, and discuss how the FAA, Coast Guard and DLA interface with DOD. This chapter will cover the entire lifecycle of flight Safety Critical parts (FSCP) starting with the basic definition and procurement policy and end with the disposal of FSCAP.

The Office of the Secretary of Defense (OSD), the Commander In Chiefs (CINCs) of the unified commands, the Chairman of the Joint Chiefs of Staff, and the Services, i.e., Department of the Army, Department of the Air Force, and the Department of the Navy make-up the core of the Department of Defense. The Office of the Secretary of Defense helps the Secretary plan, advise and carry out the nation's security policies as directed by the National Command Authority. The National Command Authority is a term used to collectively describe the President and the Secretary of Defense. The Office of the Secretary of Defense carries out the Secretaries guidance by tasking the military departments, the Chairman of the Joint Chiefs of Staff, and the unified commands. The Secretary of Defense has four key "under secretaries" to assist in the critical areas of policy (Under Secretary Defense (USD) for Policy), finance (USD Comptroller and Chief Financial Officer), force readiness (USD for Personnel and Readiness) and Purchasing (USD for Acquisition, technology and Logistics (AT&L)). Figure 1 shows the DOD organizational structure and the relationship of the Services with DLA, FAA, and Coast Guard.

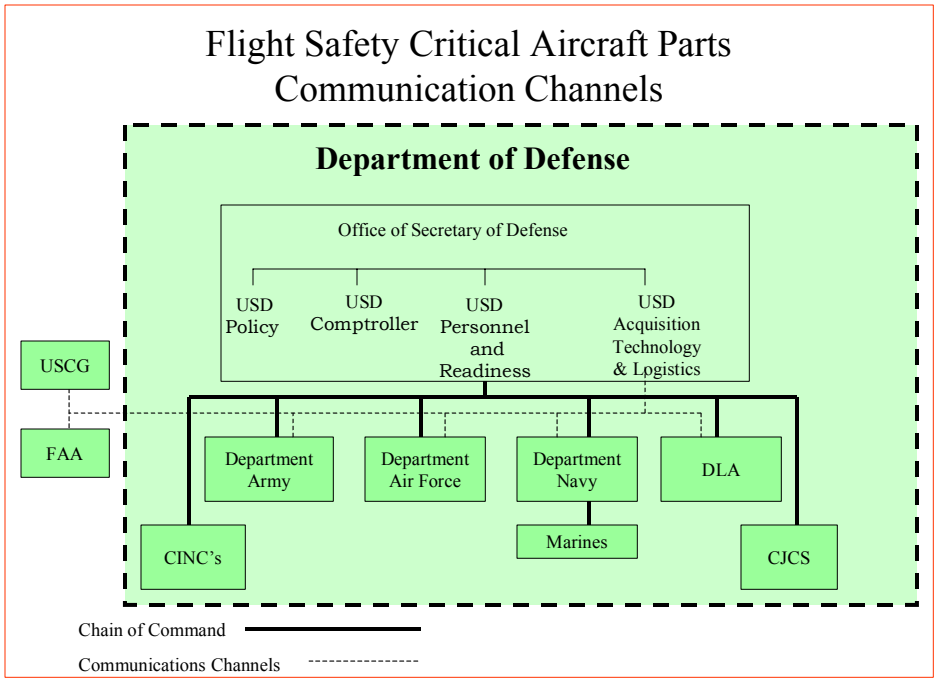


Figure 1. DOD Organizational Structure [From: Ref. 39]

The logistics communication channels differ from the organizational command structure. The USD AT&L establishes and directs the procurement and Logistics policy for DOD. The Defense Logistics Agency (DLA) is a DOD agency that has equal status with the Services. DLA provides supply support, contract management, technical, and logistics services to the military Services, DOD agencies, federal civil agencies, and select foreign governments. [Ref. 20:p 3] Each Service has an office with responsibility for Acquisition Technology and Logistics (Army – Deputy Chief of Staff, Logistics (DCSLOG), Air Force – Commander, Air Force Materiel Command, Navy – Assistant Secretary of the Navy for Research, Development, and Acquisition) which interfaces and is governed by the policies set forth by the USD AT&L. The Federal Aviation Administration (FAA) and the Coast Guard are part of the Department of Transportation (DOT) and are not governed by the USD AT&L. However, the FAA interfaces with the Services, DLA, and the USD

AT&L in the disposal and sale of surplus FSCAP to the civil and commercial aviation markets. The Coast Guard is also affected by the sale and disposal of surplus FSCP. Both the FAA and Coast Guard are users of surplus FSCAP and participant in the Federal Logistics Information System (FLIS)[29].

A. WHAT IS THE DOD DEFINITION AND POLICY FOR FSCP?

DOD uses a variety of terms associated with FSCP. [Ref. 24:s 5] Not only does each Service have it's own terms, definitions, and rules, but product families e.g., propulsion, also have their own unique terms. Figure 2 shows most of the terms used by the Services to describe variations or subsets of FSCPs.

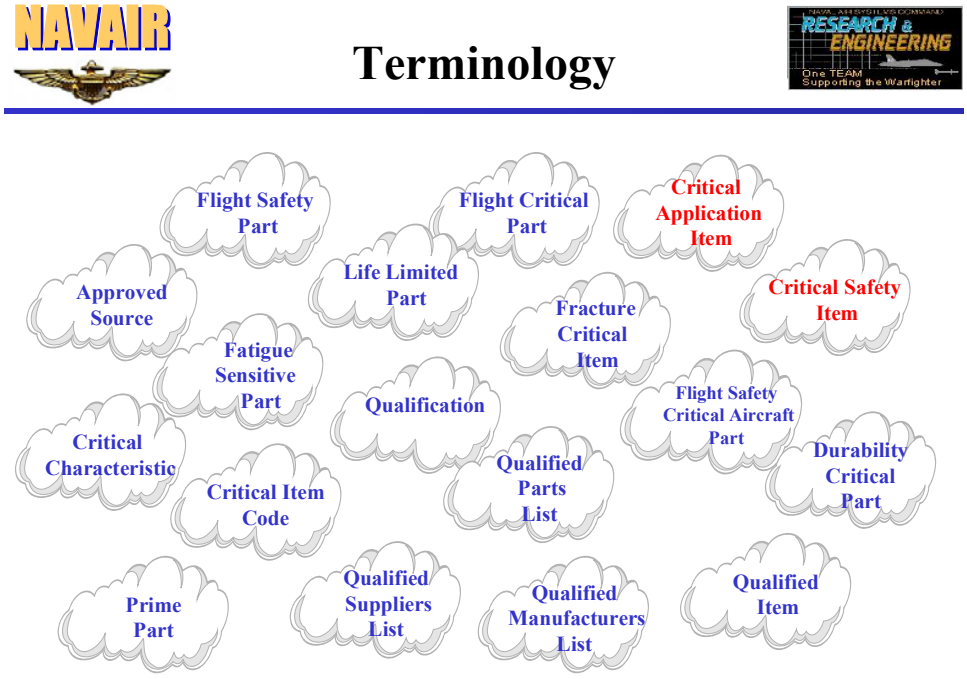


Figure 2. Terminology [From: Ref. 24]

[29] FLIS – The centralized automated repository for all national stock numbers and associated item-related data assigned to items of supply used by the Federal Government.

DOD does not have a common definition, or policy for Flight Safety Critical Parts (FSCP), however, there is a common definition, and policy for Flight Safety Critical Aircraft Parts (FSCAP).

The USD of AT&L is the proponent for DOD 4140.1R, Materiel Management Regulation (a.k.a. the super reg.). DOD 4140.1R contains the definition and policy for FSCAP, but does not address FSCP. FSCP versus FSCAP, this may be splitting hairs, however, there is a definite distinction between the two when dealing with the acquisition of flight safety parts. The FSCP initiative deals with the acquisition, i.e., control of the manufacture and post production of flight safety parts. DOD 4140.1R does not address FSCP per se. Chapter 1, Acquisition Materiel Management, of DOD 4140.1R deals with the acquisition of spare parts to sustain end items. In section C1.3, Quality Programs, the Policy states "Only secondary items that conform fully to contract specifications shall enter the DOD supply system." Paragraph C1.3.2.5 states "such quality assurance techniques and testing should stress conformance of critical application items to contract technical requirements." Chapter 1 is generic and applies to all DOD parts not just aircraft, or safety related parts. At present, there is no DOD policy specifically for FSCP. Each Service independently establishes a policy and method for the procurement of FSCP. The acquisition criteria, quality requirements, and vendor qualification for FSCP are determined by each Service ESA.

The FSCAP initiative focuses on documentation and disposal of parts, and is addressed in DOD 4140.1R, chapter 6, Other Logistics Programs, Paragraph C6.5, DOD Flight Safety Critical Parts (FSCAP) Program. FSCAP has a common definition, due to the efforts of the joint FAA/DOD FSCAP PAT, September 1994 – May 1995, and has

documentation in the FLIS with disposal instructions for each FSCAP. The FAA/DOD PAT defined FSCAP as:

> "Any aircraft part assembly, or installation containing a Critical Characteristic whose failure, malfunction, or absence may cause a catastrophic failure resulting in loss or serious damage to the aircraft or an uncommanded engine shutdown resulting in an unsafe condition." [Ref. 6:C 6.5]

The policy for FSCAP set forth in DOD 4140.1R states:

> "The Department of Defense shall identify and control FSCAP throughout their life cycle to ensure only safe parts are installed on military aircraft, or are released to the civil aircraft market though disposal sales, exchanges or other authorized transfers of DOD parts. DOD 4140.1R requires DOD to develop a criticality code structure to identify FSCAP items and ensure FSCAP without historical maintenance records are mutilated before disposal." [Ref. 6:C 6.5]

1. What is the Army's definition of FSCP?

The Army maintains a Flight Safety Parts (FSP) program in lieu of FSCP program for manufacturing and postproduction support, however, for disposal the Army uses the term FSCAP as defined in DOD 4140.1R.

The Army has two FSP definitions, one for the airframe and one for aircraft engines."Flight Safety Parts (FSP) (Aircraft and Components) – Any Part, assembly, or installation containing a critical characteristic[30] whose failure, malfunction or absence could cause loss of or serious damage to the aircraft and/or serious injury or death to the occupants." [Ref. 22:p 2]

[30] Critical Characteristics are any feature of a FSP, such as dimension, finish, material or assembly, manufacturing or inspection process, installation, operation, field maintenance, or depot overhaul requirement which, if nonconforming, missing, or degraded could cause the failure or malfunction of the FSP. [Ref. 22:p 2]

"Flight Safety Parts (Engine) – Any Part, assembly, or installation containing a critical characteristic whose failure, malfunction or absence could cause an uncommanded engine shutdown, and/or an uncontained engine failure resulting in loss of or serious damage to an aircraft and/or serious injury or death to the occupants." [Ref. 22:p 2]

2. What is the Air Force's definition of FSCP?

The Air Force does not distinguish between parts during the acquisition phase. The Air Force FSCP policy starts after acquisition and uses the definition in DOD 4140.1R for FSCAP.

3. What is the Navy's definition of FSCP?

The Navy uses the term Critical Safety item (CSI) in lieu of FSCP and FSCAP. The terms "Critical Safety Item," "Flight Safety Critical Part," "Flight Safety Critical Aircraft Part," from a Navy point of view are synonymous. The Navy defines CSI as:

"A part, assembly, installation, or production system with one or more critical characteristics that, if not conforming to the design data or quality requirements, would result in a unsafe condition that could cause loss or serious damage to the end item or major components, loss of control, or serious injury to personnel. Unsafe conditions relate to hazard severity categories I and II of Mil-STD-882C, Systems Safety Requirements. CSI are subsets of Critical Application Items (CAI), and include items determined to be "life limited", "fracture critical". "fatigue sensitive", etc. The determining factor in CSIs is the consequence of failure, not the probability that the failure or consequence would occur." [Ref. 29)

The Navy uses CSI in-lieu of FSCP in-order to include other critical equipment used to support naval Aviation. The Navy is concerned about more than "flight safety" and "aircraft parts." Naval Aviation is deeply

concerned about parts used to launch and arrest aircraft aboard ship, parts used on missiles and other weapon systems, and parts used in life-support and life saving situations. The management rules for these types of items need to be as carefully constructed and managed as aircraft parts. The term "Critical Safety Item" is generic enough to address not only all "aviation-related" critical components, but also critical components used on non-aviation platforms. [Ref. 27]

B. HOW DO THE DOD MILITARY SERVICES IMPLEMENT A FSCP POLICY?

Each Service independently establishes a FSCP policy based upon mission, Service culture, the interpretation of CICA, and the disappearance of Military Standards. This section covers the life cycle policy of FSCP, i.e., from the purchasing of FSCP to the disposal of FSCAP. The procedures for the identification, control, and disposal of FSCAP will be addressed in subsequent sections.

1. What is Army's FSP policy, and how is it implemented?

The Army's policy is to procure FSP only from sources whose parts have met engineering testing requirements.

In January 1996 Major General John E. Cusick, Commanding General of the U.S. Army Aviation and Troop Command, signed a Policy Memorandum subject: Flight Safety Parts Acquisition Policy. The purpose of this memorandum was to establish a U.S. Army policy regarding the acquisition of flight safety parts. The Policy states:

> "The Army's policy is to acquire high quality, proven, reliable, and safe Flight Safety Parts. Flight Safety Parts which require engineering testing (fatigue and/or endurance,

interchangeability) shall be procured only from sources whose part has met the engineering test requirements." [Ref. 21]

The Army's FSP program is implemented through the U.S. Army Aviation and Missile Command (AMCOM) Regulation 702-7, Flight Safety Parts / New Source Testing Program Management. AMCOM is the proponent for AMCOM Regulation 702-7. AMCOM Regulation 702-7 applies to all elements of AMCOM, its subordinate organizations, and by concurrence, Program Executive Office, Aviation, and its organizations. The Aviation and Missile Research, Development, and Engineering Center (AMRDEC) within AMCOM is the Army's ESA.

The requirements of AMCOM Regulation 702-7 apply to all FSPs and assemblies containing FSPs, i.e., FSP delivered as part of the end item, and parts purchased from the OEM, OEM licensed vendors, and breakout vendors.

The Army policy in AMCOM Regulation 702-7 covers the entire lifecycle of a FSP. To cover the entire gamut from cradle to grave the policy for FSP in AMCOM Regulation 702-7 is broken down into 4 categories; Management policy, Acquisition policy, Issue policy, and Repair/Overhaul policy. The Army applies the FSCAP policy in 4140.1R for the documentation and disposal of FSCAP.

Management policy

All Army FSP are controlled and managed by AMCOM. [Ref. 22:p 3] DLA manages consumable FSP for AMCOM[31], but in keeping with AMCOM Regulation 702-7 FSP management policy, AMRDEC is the ESA for Army FSP. DLA maintains a STDP for army FSP in order to buy new parts to replenish the supply system. The Army ESA maintains the master STDP and updates the DLA STDP as changes occur. If DLA has questions or concerns about the STDP or technical requirements, DLA contacts the Army ESA for answers or clarification.

AMRDEC has the engineering and technical expertise to identify, maintain, and preserve the critical characteristics, which makes up a FSP. AMRDEC is the final authority for Army FSP. When DLA buys new FSP, the buying ICP reviews the SAMMS for the current Technical Data Package or configuration of the part. If there is an anomaly, or a question about the part or qualified buyers, the ICP will send an Engineering Support Request, DLA Form 339, to AMRDEC to obtain the current technical data package and qualified suppliers list. Figure 3 shows the DLA FSP acquisition process.

Acquisition policy

The Army's policy is to acquire high quality, proven, reliable, and safe Flight Safety Parts. AMCOM Reg. 702-7 further defines the Army's policy in that only new unused FSP will be procured from approved sources. An approved source is a manufacturer or vendor who has satisfied, prior to contract award, all AMCOM source approval requirements to include, if applicable, engineering testing requirements

[31] AMCOM manages Army unique repairable FSP and DLA manages consumable and DOD common repairable FSP for the Army.

(fatigue, endurance, and/or interchangeability). Procurement of recycled, recovered, remanufactured, surplus, used, or reconditioned FSP is not authorized, and local procurement of FSP is not authorized. [Ref. 22]

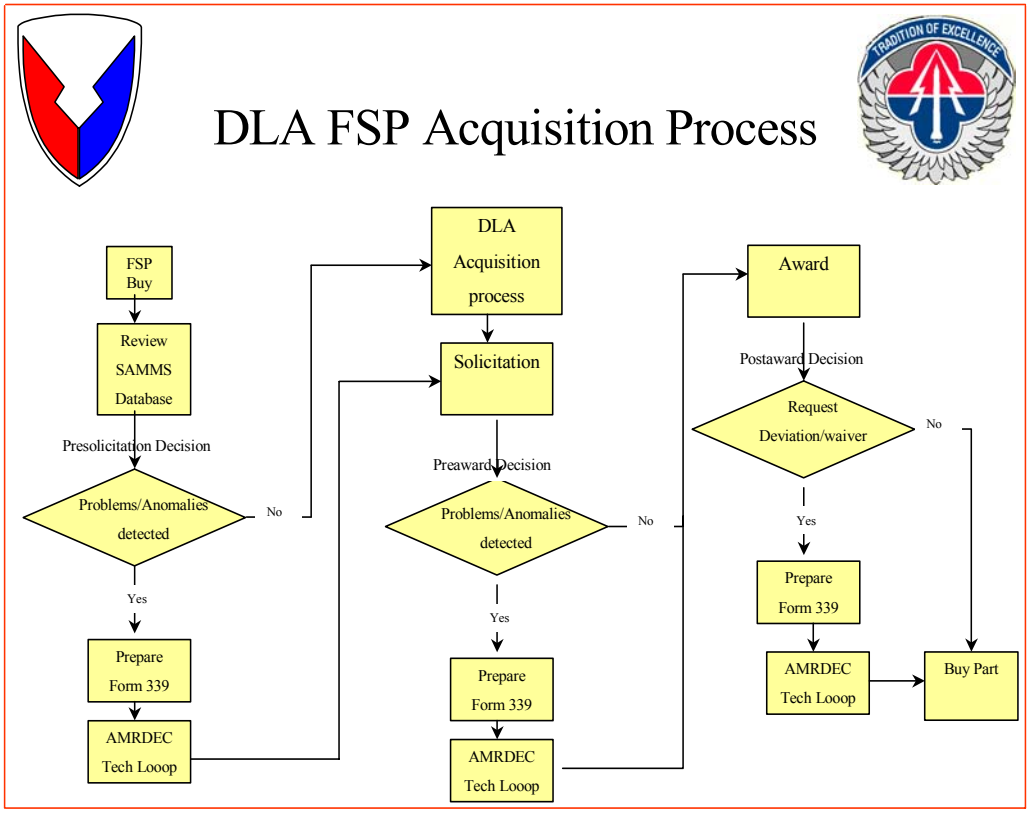


Figure 3. DLA FSP Acquisition Process [From: Ref. 39]

Through the Supplier Interface And Oversight Program (SIOP), the Army continuously performs surveillance visits, quality inspections of contractors' facilities, routinely monitors contractor performance, and performs conformance inspections and audits. SIOP reviews contractor frozen process planning, assures compliance with FSP program requirements, documents findings and issues, and establishes dialog with manufactures regarding FSP program and program requirements.

If a contractor has difficulty in maintaining process control as evidenced through such things as adverse internal management audits, customer audits, the receipt of Quality Deficiency reports or adverse SIOP results, the contractor shall be subject to removal from the approved supplier list. [Ref. 22:p 3]

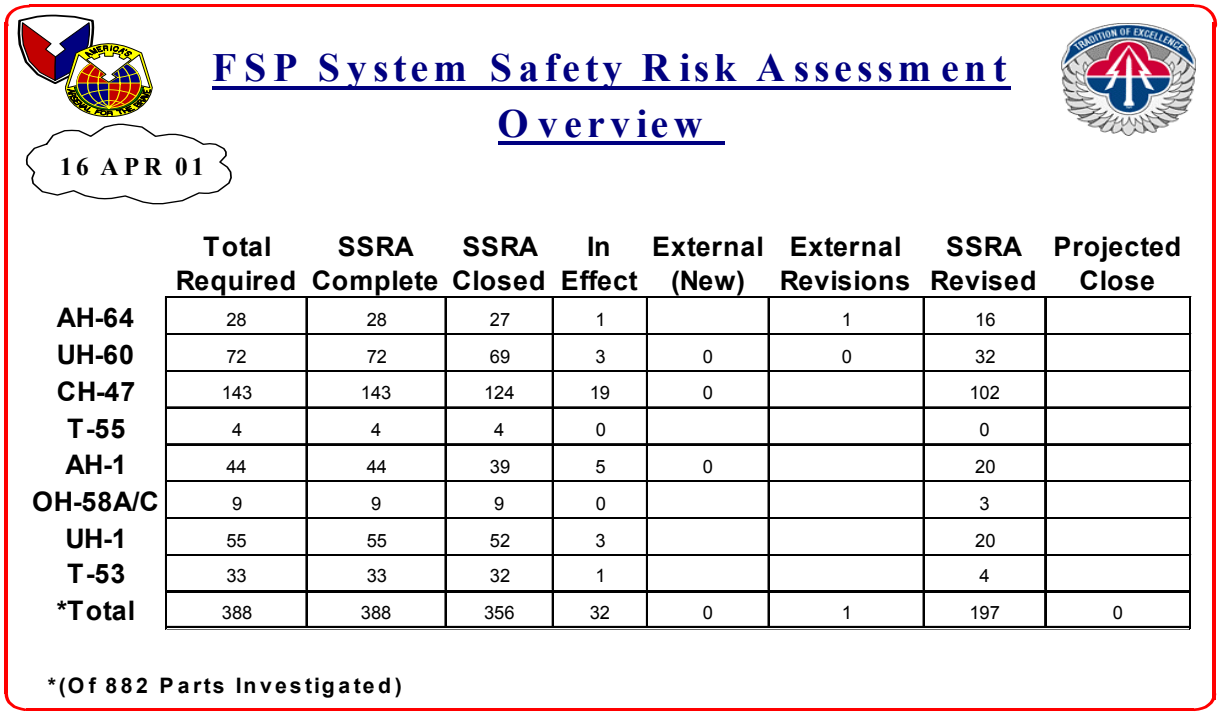
All contractors for Army FSP containing manufacturing critical characteristics are required to maintain a documented quality program to the standards of Quality Engineering Standard 1 (QE Std-1) or better. QE Std-1 is a quality standard that establishes the minimum quality program that is required to manufacture FSP containing manufacturing critical characteristics.

Issue policy

Only fully qualified FSP (procured form approved sources) will be released for use on Army aircraft. The AMCOM Commanding General may waive this requirement in order to meet critical mission requirements. If the qualification requirement is waived, the part released is considered suspect, and a Systems Safety Risk Assessment (SSRA) is performed to determine the risk involved.

FSP in the army inventory purchased from breakout vendors prior to the issuance of the Army FSP Policy memorandum were not tested. Suspect parts purchased from breakout vendors were in the army inventory and on army aircraft. Due to operational readiness and mission requirements all untested FSP purchased from breakout vendors could not be removed from operational aircraft and the supply system.

The army assessed the risk of continuing to use untested parts until the parts could be tested or purged from the inventory and replaced by tested parts. The army is still performing SSRAs on untested parts today. Figure 4[32] shows the progress the Army is making toward removing untested parts from the inventory. The bottom line is after the untested parts have been purged from the inventory, the Army will use only FSP from tested sources.



FSP System Safety Risk Assessment Overview

16 APR 01

	Total Required	SSRA Complete	SSRA Closed	In Effect	External (New)	External Revisions	SSRA Revised	Projected Close
AH-64	28	28	27	1		1	16	
UH-60	72	72	69	3	0	0	32	
CH-47	143	143	124	19	0		102	
T-55	4	4	4	0			0	
AH-1	44	44	39	5	0		20	
OH-58A/C	9	9	9	0			3	
UH-1	55	55	52	3			20	
T-53	33	33	32	1			4	
*Total	388	388	356	32	0	1	197	0

*(Of 882 Parts Investigated)

Figure 4. SSRA Overview [From: Ref. 38]

Repair/Overhaul policy

Depot level overhaul/repair will be accomplished only by qualified sources. Prior to authorizing field, organic, or commercial depot repair of an FSP, AMCOM will perform a Product Verification Audit (PVA). A PVA ensures the potential repair activity has frozen process planning,

[32] Status of Army SSRA as of 16 Jan 01.

is capable of performing the repair, and maintains the safety integrity of the FSP.

All contractors performing M&O for Army FSP are required to maintain a documented quality program to the standards of QE Std-2 or better. QE Std-2 is a quality standard that establishes the minimum quality program required for the M&O of assemblies that contain or affect a critical characteristic.

The Army's policy includes the documentation and disposal of FSP. AMCOM Regulation 702-7 compliments and enforces the DOD FSCAP policy in DOD regulation 4140.1R, and covers the entire lifecycle of a flight safety part

2. What is the Air Force's FSCAP policy, and how is it implemented?

The Air Force has two categories of FSCP one for the acquisition of engine parts, Engine Flight Safety Critical Parts (EFSCP), and one for the acquisition of airframe parts FSCP. The Air Force EFSCP policy is to restrict the acquisition of propulsion FSCPs to the OEM or an OEM licensed vendor. This policy is currently restricted to propulsion components, and was developed through a Joint Propulsion Coordinating Committee (JPCC) initiative (Mar 99) based on an in-depth study specifically focused on propulsion components. The Air Force no longer qualifies alternate sources for EFSCPs, and in the limited cases where breakout has occurred the approval is being revoked. The policy has a caveat; the Air Force ESA, using specific criteria specified in a Memorandum Of Agreement (MOA) signed by the JPCC, must approve OEM-licensed vendors. In essence the approval involves review of the

license agreement with the OEM to insure that the agreement provides the essential value added by the OEM that was specifically identified in the EFSCP study. The JPCC policy was later endorsed by the Joint Aeronautical Commanders Group (JACG) (Mar 99) but the endorsement was specific to propulsion components. In order to restrict competition effectively and defend against challenges it is necessary to document value added by the OEM that cannot be replaced by the Government or alternate sources. [Ref. 36]

The Air Force does not have a policy for the acquisition of airframe FSCP. The Air Force procures FSCP from the OEM, or OEM licensed vendors. Air Force Materiel Command engineers review each item as to the criticality, complexity and the consequence of failure, and determine if, and why qualification requirement must be demonstrated before contract award. If this analysis is affirmative, a Qualification Requirement (QR) Wavier is developed for the item in accordance with (IAW) the requirements of Federal Acquisition Regulation (FAR) 9.202(a) or 9.202(b). Where reprocurement data is available, the basis for a source restriction is FAR 9.2. On the extremely critical/complex & disastrous consequence of failure type items, many engineers process FAR 9.202 QR Waivers even when there is no data or data is proprietary. The individual engineer is responsible for these decisions.

Normally an item that is acquired via Local Purchase will not be identified as FSCAP; however, in the unusual circumstance that a FSCAP item is authorized for Local Purchase, the purchase must be made from an FAA approved contractor or production facility and the purchase request must include the requirement for an FAA Form 8130-3, Airworthiness Tag. Items bought using the International Merchant

Purchase Authorization Card (IMPAC) must comply with United States Air Force procedures for using the IMPAC. The retail level of supply must never designate an item as FSCAP or assign a criticality code; these actions are only authorized to be accomplished at the wholesale level.

For documentation and control of FSCP, the Air Force FSCP policy is identified as Flight Safety Critical Aircraft Parts (FSCAP) and it is implemented in AFMAN 23-110, Vol. 6, Chapter 10.

3. What is the Navy's CSI policy, and how is it implemented?

The Navy's CSI program is implemented through NAVAIRINST 4200.25C, "Engineering Reviews Of New Sources For Procurement Repair Or Overhaul Of Replenishment Critical Safety Items", 3 September 1999. NAVAIRINST 4200.25C establishes policy, procedures, and assigns responsibilities for engineering reviews of Source Approval Requests (SARs) for the procurement, repair, or overhaul of Naval aviation replenishment spare parts that meet the definition of CSI. [Ref. 31:p 1] The Naval Air Systems Command (NAVAIR) is the proponent for NAVAIRINST 4200.25C, and it applies to the Naval Aviation Systems Team, Systems engineering Department (AIR-4.1), Air vehicle Systems and Subsystems Department (AIR-4.3), Propulsion and Power Engineering Department (AIR-4.4), and the Navy Inventory Control Point, Philadelphia, PA (NAVICP-P), and cognizant Naval Aviation Depots (NAVAVNDEPOT). [Ref. 31:p 1]

The acquisition policy for the Navy is to procure only new and unused CSI from approved sources, and the Navy will accept only CSIs that conform to all critical characteristics. The NAVAIR Research and

Engineering group (AIR 4.0) is responsible for providing the engineering policies, processes, and support necessary to ensure design integrity and airworthiness throughout the lifecycle of naval aviation systems and equipment. [Ref. 29:p 2] NAVAIR is the Engineering Support Activity (ESA) and the airworthiness authority for the Navy. Only NAVAIR is authorized to approve sources for the procurement of CSI.

To ensure alternate sources remain capable of delivering satisfactory items, NAVAIR 4.0 reevaluates alternate sources if they have not delivered or repaired/overhauled the specific CSI for DOD within 3 years of an anticipated contract award. Alternate sources shall be reevaluated if there are concerns regarding product quality, manufacturing process changes, the source moves their manufacturing location, or the source has transferred their manufacturing facilities over the prior 3 years. [Ref. 29:p. 5]

The repair/overhaul of Naval aviation systems and equipment containing CSIs will be from approved sources only. Navy Aviation depots (NAVAVNDEPOTs) and other government organic facilities are authorized to make CSIs on a limited basis provided they meet the alternate source qualifications criteria. NAVAVNDEPOTs and other government facilities are considered alternate sources for CSIs and must meet the qualification criteria of alternate sources. When a CSI cannot be procured from the Prime vendor or from alternate sources and the technical data is not available reverse engineering may be considered.

The Competition In Contracting Act of 1984 mandated the breakout of repair parts and consumable items to stimulate competition and to provide small and disadvantaged businesses access to lucrative

defense contracts. Initially the Navy did not take breakout of CSI seriously. The Navy developed a Justification and Approval (J&A) for sole source procurement of FSP from the prime vendor. The Navy did not want to set precedence for the breakout of CSI, they wanted to make the prime vendor responsible for the parts the prime vendor produced. However, the Navy did start qualifying alternate sources for procurement of CSIs in the late 1997 time-frame.

Initial experiences in implementing breakout of CSI demonstrated that controls were needed before acquiring CSIs from new sources of supply. [Ref. 25] Navy ICPs have complete independence and authority to make breakout decisions on Non-CSIs, [Ref. 26:p 1-1] however, NAVAIR is the Aircraft Airworthiness Authority for the Navy and makes all breakout decisions for CSIs.

DLA provides item management functions for DOD. Consumable Item transfer (CIT) from the Services to DLA began in 1991. CIT was performed in two phases. CIT I was performed from August 1991 to November 1995, the Navy transferred 760,000 items to DLA for management; a significant number of CAIs were transferred. CIT II was performed from January 1996 to October 1997, and 152,000 Navy Items were transferred. CIT II included Navy unique CAIs and a majority of the Navy's CSIs were transferred.

DLA manages 3,795 CSI NSNs for the Navy, and in Sept 2000 the navy identified 942 CSIs which were procured from suspect sources[33]. Figure 5 [Ref. 24:s 7] shows the distribution of Navy NSNs by category.

[33] A source that has not been approved as an alternate source. A source whose part has not undergone rigorous engineering test to prove the part meets the required physical characteristics.

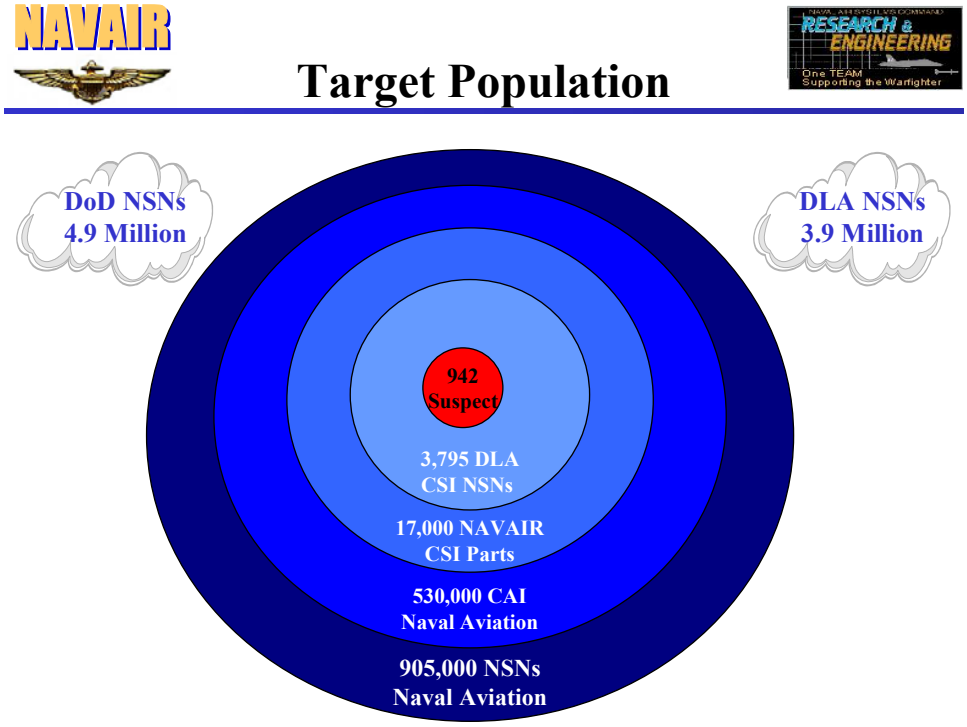


Figure 5. Target Population [From: Ref. 24]

C. HOW DO THE MILITARY SERVICES IDENTIFY, DOCUMENT, AND CONTROL FSCP?

This section studies the procedures for the identification, documentation and control of FSCP used by each Service.

A FSCAP Process Action Team (PAT), consisting of members from the FAA, Coast Guard, DOD, Army, Navy, Air Force, and DLA, chaired by Mr. James R Klug, Deputy Under Secretary of Defense and Mr. Anthony J. Broderick, Associate Administrator, FAA, produced a final report dated 8 May 95. An implementation FSCAP team was formed to carry out the tasking set forth in the PAT Final report. The Office of the Secretary of Defense (OSD) chaired this team with representatives for the FAA, Coast Guard, Army, Navy, Air Force, and DLA. DOD 4140.1R, DOD materiel

Management Regulation, section C6.5, DOD Flight Safety Critical Aircraft Parts (FSCAP) Program was a product of this team. Section C6.5 of DOD 4140.1R was published in May 1998. [Ref. 34]

The DOD policy for FSCAP as published in DOD 4140.1R, C6.5 is:

> "The Department of Defense shall identify and control FSCAPs throughout their life cycle to ensure only parts are installed on military aircraft or are released to the civil aircraft market through disposal, exchanges or other authorized transfers of DOD parts. The Department of Defense shall develop a criticality code structure to identify FSCAP items and ensure that used FSCAP items are mutilated if they are being disposed of without historical maintenance records, Loans, gifts and exchanges made under 10 U.S.C. 2572 that involve FSCAPs shall be done in accordance with DOD 4160.21-M and DOD 4160.21-M-1." [Ref. 6:C6.5]

DOD 4140.1R requires all FSCAPs to be identified in the FLIS by an applicable criticality code, and DOD 4140.1R requires repairable FSCAP to be managed and tracked by Serial number where practical. [Ref. 6:c 6.5] DOD 4140.1R also requires historical records for FSCAP to be maintained and shipped with the part.

1. How does the Army identify and document FSCP?

Initially the OEM identifies parts that are to be considered FSP, the Army ESA reviews and approves the list, and adjusts the list based on reports from the field, i.e., Equipment Improvement Recommendations, Quality Deficiency Reports, Report of Discrepancy, accident report etc. The Classification of an item as an FSP is based solely on its influence on flight safety and not upon considerations such as item cost, complexity, fatigue life, and/or procurement lead times [Ref. 22]

The Army FSP program requires life cycle identification and control of all Army FSP and their associated critical characteristics. The Army requires engineering part or assembly drawings for FSP to be marked as FSP, and all critical characteristics are required to be documented on The FSP drawing. Critical characteristic identification and control procedures are required to be included in all related maintenance and overhaul documents. All Army FSP are required to have a serial number, and all technical and quality requirements relating to FSP shall be traceable to the time and location that they were produced. Those FSP which have only "installation critical characteristic" and no life tracking requirements are not required to be serialized, but still require tractability to the manufactured lot. [Ref. 22:p B3] For Dual use parts, the following clause is required to be inserted into all contractual requirements for FSP:

> "The offeror shall identify in its proposal any item being offered which is also currently sold to commercial customers and for which FAA Form 8130-3 is supplied by the offeror. For such items the offeror shall provide the same form to the government at the time of item delivery." [Ref 22:p 4]

The Army identifies FSP in the Commodity Command Standard System (CCSS) and assigns a criticality Code of "E" or "F"[34] designating the part as FSP. Sector 2800 of the National Stock Number Master Data Record (NSNMDR) shall be updated to uniquely identify FSP that have manufacturing critical characteristics, and engineering testing requirements.

2. How does the Air Force identify and document FSCAP?

[34] Criticality code of "F" designates an item to be FSCAP. Criticality code of "E" designates an item to be nuclear hardened FSCAP.

The Air Force policy for the identification and documentation of FSCAP is contained in Air Force manual 23-110, Volume 6, chapter 10 Flight Safety Critical Aircraft Parts (FSCAP) Program. The Air Force FSCAP program is modeled after the DOD FSCAP policy found in DOD 4140.1R, C6.5.

As new weapon systems are developed the criticality code is determined during the normal provisioning process, and FSCAP are assigned a criticality code of "E" or "F". The wholesale Inventory Manager (IM) is responsible for designating and assigning the critically code to FSCAP items they manage. The IM adjust the initial provisioning list of FSCAP based on reports from the field, i.e., has the part been involved in an accident. Any item that meets the criteria for FSCAP when reviewing drawings, Logistics Support Analysis Record (LSAR) (if the aircraft was developed under MIL-STD-1388-2B), Essentiality Codes (EC), and Failure Modes Effects Criticality Analysis (FMECA), and/or Reliability Centered Maintenance (RCM) analysis are considered FSCAP and are assigned a Criticality Code of E or F. In reviewing the EC if it is determined that the aircraft cannot fly when the item fails, or if the aircraft can still fly after failure of the item, but there is risk to personnel safety then the item is considered to be FSCAP. If the aircraft was developed with MIL-STD-1388-2B on contract, the essentiality code can be found in the LSAR HG Table. If the aircraft was developed with MIL-STD-1629A on contract, then the category I and category II Failure Mode List should be used to identify the FSACP. [Ref. 32]

The Air Force Controls and tracks FSCAP by serial number throughout the life cycle of the item. Serial numbered items are required to be accompanied by historical maintenance records. Items that are not

assigned a serial number may be designated as FSCAP; however, non-serialized items will not have historical maintenance records available for specific individualized items. Used FSCAP items without the appropriate historical maintenance documentation and new FSCAP item without the original manufacturer's pack and contract data must be mutilated prior to turn-in to the DRMO. [Ref. 32:para. 10.3.1.1.1] Activities are required to forward all available historical data/documents with individual FSCAP items when the materiel is shipped to another user or transferred to the DMRO. Historical Documentation shall consist of the Air Force Technical Order (AFTO) Form 95 or computer generated facsimile and/or FAA Form 8130 (Airworthiness approval Tag). [Ref. 32:para. 10.3.1.1.2]

Each item that is processed by the Repair Cycle Support Unit and returned to a Supply facility for storage must be accompanied by a computer generated maintenance historical record (facsimile AFTO Form 95). All repairable serially controlled FSCAP items that have been processed by maintenance are required to have the maintenance historical record attached. When a FSCAP item is turned-in by maintenance without the historical record/documentation the condition tag or label shall be annotated "Historical maintenance records are not available." All used FSCAP items that do not have historical maintenance records available, must be mutilated prior to turn-in to DRMO. The maintenance activity shall not mutilate any FSCAP items until the items are actually declared excess and directed for transfer to DRMO. [Ref. 32:para. 10.3.4]

3. How does the Navy identify and document FSCP?

The NAVAIR Basic Design Engineer (BDE) determines if a new replenishment item is to be classified a CSI, and during initial

provisioning of an item, the Navy ESA verifies the item is a CSI. Items are initially treated as CSIs when identified as life limiting, fatigue sensitive, Fracture Critical, or Engineering Critical and having at least one critical characteristic in the technical data, or identified in a contractor's critical parts list. [Ref 29:p 3]

Drawings and associated technical data shall clearly identify that the item is CSI. Drawings and technical data shall identify the critical and major characteristics, critical processes, and quality assurance requirements. Drawings for CSIs shall be IAW the latest version of ANSI Y14.100, Engineering Drawing Practices, and MIL-STD-100G, DOD Standard Practice for Engineering Drawings. Critical and major characteristics for CSIs shall be established in accordance with DOD-STD-2101,

Repairable CSI are managed, documented and tracked by serial number throughout their lifecycle. When required by technical documentation, consumable CSIs shall also be managed, documented, and tracked by serial number throughout their lifecycle. When not required by technical documentation, consumable CSI shall have serial number, contractor cage codes, or distinguishable marking schemes where applicable. Changing the manufactures marking on a CSI is prohibited.

D. HOW ARE FSCP MANUFACTURERS QUALIFIED AND PARTS TESTED BY EACH SERVICE?

Due to the requirement of CICA, spare parts are required to be broke-out; DOD 4140.1R[35] reinforces this requirement. The DOD procurement policy in DOD 4140.1R is that only secondary items that conform fully to contract specifications are to enter the DOD supply system. [Ref 6:para. C1.31] Since most contract specifications for FSCP critical characteristics cannot be confirmed without engineering testing, i.e., materiel, tolerances, hardness, strength, etc, it is essential to qualify the processes and procedures of contractors who are awarded FSCP contracts. Once the contract for an FSCP is awarded, stringent quality assurance methods are required to be demonstrated and tested to ensure that manufactured items conform to contract technical requirements.

1. How does the Army qualify FSP manufacturers, and what testing is required?

The Prime Contactor is responsible for the design of the aircraft and establishes the technical requirements and critical characteristics for all components and piece parts. Prime contractors of Army aircraft are required to identify FSP that have manufacturing and installation critical characteristics[36], and establish and maintain a FSP program. As part of the FSP program, contractors are required to have a Contractor Configuration Control Board (CCB) that monitor and control the FSP program. The prime contactor is contractually required to perform periodic audits of their subcontractor's/vendor's FSP program to assure

[35] DOD shall reduce the costs of spare parts through the use of competitive procurement methods, or the purchase of parts directly for the actual manufacturer rather than the prime contractor while maintaining the integrity of the systems and equipment in which the parts are to be use. The DOD Spare parts breakout program shall carry out that policy. [Ref 6:para C1.5.1]

[36] Manufacturing Critical Characteristics: Critical characteristics produced during the manufacturing process.
Installation Critical Characteristics: Critical Characteristics that are not introduced during the manufacture

that adequate program controls are in place and complied with. At a minimum, audits will be performed at the start of each production contract, annually, and when process changes occur. [Ref. 22:p C4]

In keeping with CICA, and DOD 4140.1R, spare parts are required to be broke-out. The Army's FSP policy meets that intent, i.e., FSP will only be procured from approved sources. The AMCOM new source-testing program requires breakout contractors to establish a FSP program, and pass engineering qualification testing. Manufacturing engineering qualification requirements include First Article Test (FAT). First Article testing, test all the critical characteristics of the part, i.e., metallurgic, fatigue, stress, hardness, tolerance, etc. M&O Engineering qualification requirements consist of a Product Verification Audit (PVA). AMCOM standards for a FSP program are the same for breakout contractors and prime contactors alike. Contractors are required to establish and maintain a quality program, QE Std 1 is the minimum standards for a manufacturers quality program, and QE Std 2 is the minimum requirements for M&O contractors. Each manufacturing, assembly, and M&O process producing a critical characteristic is required to be controlled by detailed procedures outlining each step of the process including tooling, equipment, and operator certification requirements. These procedures are reviewed and approved by the CCB and AMCOM. Once approved, these procedures, including sequence of operations, are required to be frozen, if any portion of the procedure changes the process must be requalified.

Maintenance and Overhaul (M&O) contractors which overhaul/repair FSP with critical characteristics or installation critical

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of a part, but are critical in terms of assembly and/or installation, e.g., proper torque. [Ref. 30:slide 5]

characteristics are required to meet the same qualification requirements as manufactures of new parts. New and Overhauled/repaired FSP cannot be released to the supply system until the contractor passes the PVA.

If there is a critical need for a FSP part the Commanding General of AMCOM may waive the testing requirements. For parts released without a engineering test a System Safety Risk Assessment must be performed and approved before distribution. All critical characteristics that can be nondestructively inspected/tested require 100% inspection by the contractor, or subcontractor. Critical characteristics that require destructive testing are to be tested on a lot or batch basis, with no skip lots allowed. Once the program demonstrates that the critical processes are statistically in control, stable and capable, the contractor may request inspection by a statistical process control program in lieu of 100% inspection. [Ref. 22:p C4]

2. How does the Air Force qualify FSCP manufacturers, and what testing is required?

The Air Force does not breakout FSCP. The Air Force engineer responsible for the FSCP determines and documents the critical characteristics for the FSCP and produces a QR Waiver to procure the part from the OEM, OEM licensed vendor or prime Contractor. The Air Force exerts extensive process control over prime contractor to ensure procedures are in place to control the critical characteristics and ensure high quality.

3. How does the Navy qualify CSI manufacturers, and what testing is required?

The acquisition policy for the Navy is to procure only new and unused CSI from approved sources. Approved sources include the prime contractor, the actual manufacturer who made the part for the prime contractor, fully licensed vendors of the prime contractor, and alternate sources approved by the Navy ESA. Prime contractors, and actual manufactures for the prime contractor that have quality plans approved by the government do not need to be requalified. CSI sources approved by other Services that have common parts with the Navy do not need to be requalified.

Navy ESAs reevaluate alternate sources for CSI if there are concerns relating to product quality, manufacturing process changes, or they have not produced a part within three years of a proposed contract. Surplus offers of CSIs are considered only if the supplier provides substantiation that the proposed item was originally manufactured by an approved source, the item is new and unused, the surplus item conforms to the item technical data requirements, and the shelf-life or other time critical aspects of the item are well within established limits.

E. WHAT PROCEDURES ARE USED TO RETIRE AND DISPOSE OF FSCAP BY EACH SERVICE?

DOD is required by the Surplus Property Act of 1944 to dispose of its surplus property; however, it is prevented from destroying property with any economic value. This section studies the disposal methods of FSCAP for each Service

1. What is the Army's FSP retirement and disposal procedure?

The Army's policy for disposal is embedded in DOD 4140.1R. The Army's policy is to release surplus FSP to the Defense Reutilization and Marketing Offices (DRMO) for disposal. FSP that are serviceable, and have historical records attached will be released to other government agencies, or sold to civil aviation. FSP that have exceeded their useful life, or do not have historical records will be mutilated.

2. What is the Air Force's FSCAP retirement and disposal procedure?

The Air Force Policy is; only serviceable FSCAP with historical maintenance documentation attached will be released to the DRMO for disposal or release to the civil aviation market, all FSCAP without proper historical maintenance records will be mutilation. Used serviceable FSCAP items that do not have historical maintenance documentation may be issued or shipped to other DOD activities (other than DRMO), provided that the activity agrees that they can use the item without the documentation. FSCAP without historical maintenance records may be issued or turned-in to DRMO without applying the mutilation requirement if the materiel is new/unused and still packaged in the original manufacturer's container that reflects all of the identification and contracting data.

Supply activities will not accept any FSCAP item for storage unless the historical maintenance records are attached, or the materiel condition tag is annotated "Historical Maintenance Records are Not Available". When an item is designated as FSCAP and the historical documentation is not available, the item shall be processed to the

appropriate maintenance activity for mutilation prior to being turned-in to DRMO. [Ref. 32:para. 10.3.4.3]

3. What is the Navy's CSI retirement and disposal procedure?

All CSIs shall be considered to be FSCAP in accordance with DOD Regulation 4140.1R, C6.5, DOD Flight Safety Critical Parts (FSCAP) Program. When CSIs are no longer required by naval aviation, the CSIs and associated documentation shall be provided to the DRMO for disposal. CSIs that are defective, nonconforming, have exceeded or are approaching their life for time/use critical limits, or for which there is no reliable documentation regarding the manufacture, acquisition, use, modification, repair, or overhaul shall be mutilated prior to disposal. [Ref. 29:p 9]

F. HOW DOES THE FAA INTERFACE WITH THE DOD FSCP PROGRAM?

The FAA is part of the Department of Transportation. The FAA coordinates and communicates with DOD at the executive level. The FAA and DOD coordinate policies that affect both Military and Civil Aviation.

The Federal Aviation Administration (FAA) is the element of the U.S. government with primary responsibility for the safety of civil aviation. The FAA issues and enforces regulations and minimum standards relating to the manufacture, operation, and maintenance of aircraft. As part of its activities, the FAA periodically reviews and updates the regulations, and issues policy guidance to its inspectors and

advisory information to the industry to achieve compliance with the regulations.

DOD is required by the Surplus Property Act of 1944 to dispose of its surplus property. Consequently, certain aviation parts that are considered surplus by the military are sold. Some of these may be unfit for any aviation application, some may not be appropriate for use on a civil aircraft, and others may be acceptable for use on civil aircraft. One of the important questions is whether or not there is sufficient documentation or other identifying information associated with a given part to determine which of these three possibilities is the case.

Within the past 5 years, the FAA has intensified its efforts to educate inspectors and the public regarding the potential safety threat posed by aeronautical parts that do not meet applicable design, manufacture, and maintenance requirements. The FAA encourages the reporting of parts that may not meet applicable standards. In 1993, the FAA established the Suspected Unapproved Part (SUP) Program to coordinate FAA efforts to minimize safety risks posed by the entry of "unapproved" aircraft parts into the U.S. aviation inventory and their installation on aircraft. Aviation parts that had been produced for military applications, or produced for FAA-certificated products but subsequently operated in a military environment, may not have been produced, operated, or maintained in accordance with the Federal Aviation Regulations. Their use may pose a safety.

As a result of these concerns, in 1993 the FAA Regulation and Certification Organization established a SUPs Task Force to thoroughly review the issue of SUPs, evaluate the FAA's related on-going efforts, and

to devise a comprehensive Program Plan to eliminate any potential risk to aviation safety. The Task Force reviewed the planned steps for implementation of the DOD/FAA program with respect to surplus military parts and concluded that this program adequately addresses their concerns relating to SUPs. [Ref. 34]

In 1993 and 1994, various concerns regarding military surplus aircraft parts, specifically those parts designated by the proponent military Service as FSCAP, entering into the civil marketplace led to the forming of a joint DOD/FAA FSCAP PAT. This team, representing DLA, Army, Air Force, Navy, and the FAA, produced recommendations related to the identification, disposition and control of FSCAP. [Ref. 35:p 4]

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IV. DATA ANALYSIS

This Chapter analyzes the data presented in Chapter III.

A. IS THE DOD DEFINITION AND POLICY FOR FSCP ADEQUATE TO ENSURE SAFE AIRCRAFT PARTS?

DOD does not have a common definition, or policy for the acquisition of FSCP, each military Service independently establishes policies and procedures for the manufacture and post production support of FSCP. However, there is a common definition, and policy for documentation, and disposal of FSCAP[37].

The DOD policy for FSCAP is documented in DOD 4140.1R, Chapter C6.5, DOD Flight Safety Critical Parts (FSCAP) Program. The DOD FSCAP definition captures the intent of the FSCAP program and is readily accepted by the military Services, the FAA, and most users. The definition for FSCAP is deemed appropriate. The FSCAP policy is from a high level perspective and covers the documentation and disposal of FSCAP effectively, however it is silent as to quality requirements for the acquisition or repair of FSCP. The qualification of new sources of supply and repair is also left open. The intent of the Flight Safety Critical Aircraft Parts Program is to address the issues, needs, and requirements, to acquire safe, reliable quality parts, but the upfront logistics to accomplish this goal has been overlooked in DOD 4140.1R, C6.5.

[37] The Navy uses the term CSI in lieu of FSCP and FSCAP, and the CSI for the purpose of definition is synonymous with both terms.

B. COMPARE/CONTRAST THE DOD MILITARY SERVICE'S FSCP POLICY.

Each Service has a policy and procedure for managing FSCP. These policies and procedures are similar in some ways and quite different in other ways. In comparison all three Services make a distinction between the acquisition of FSCP, i.e., manufacturing and post production from FSCAP, i.e., the identification, documentation, and disposal. In contrast the terminology used by each Service is different; the Army uses FSP, the Air Force uses FSCAP for life cycle support of FSCP; however, this does not include the upfront acquisition process, and the Navy uses the CSI. The Army and the Navy both qualify alternate sources for the procurement of FSCP, while the Air Force uses a QR waiver to procure FSCP from the OEM only, or an OEM licensed vendor.

Each Service uses service unique regulations for the acquisition of FSCP, but they all use a derivative of DODD 4140.1R for identification and disposal of FSCAP. The army uses AMCOM Reg. 702-7, Flight Safety Parts/New Source Testing Program management. The Air Force uses Air Force Manual 23-110, Volume 6, Chapter 10, Flight Safety Critical Aircraft Parts (FSCAP) program; however, this does not include the upfront acquisition process. The Navy uses NAVAIR INSTRUCTION 4200.25C, Engineering Reviews of New Sources for Procurement repair or overhaul of Replenishment Critical Safety Items.

Each Service has a unique policy for the acquisition of FSCP. The Army policy is to buy high quality proven, reliable, and safe FSP, procured only from approved source, i.e., sources that have passed engineering testing. The Army further refines this policy and restricts

the acquisition of FSP to the procurement of only new unused FSP from qualified vendors. The Procurement of recycled, recovered, remanufactured, surplus, used, or reconditioned FSP is not authorized, and local procurement of FSP is not authorized. The Air Force does not breakout the acquisition of FSCAP, The Air Force uses a QR waiver to buy FSCAP from the OEM only. Under certain conditions the air Force does allow local purchase of FSCAP. When a FSCAP item is authorized for Local Purchase, the purchase must be made from an FAA approved contractor or production facility and the purchase request must include the requirement for an FAA Form 8130-3, Airworthiness Tag. The Navy procures only new and unused CSI from approved sources, and accepts only CSIs that conform to all critical characteristics.

DLA manages consumable and some repairable FSCP for each Service. Each Service has an ESA that controls, interfaces and coordinates technical requirements and critical characteristics with DLA.

C. COMPARE/CONTRAST HOW EACH SERVICE IDENTIFIES, DOCUMENTS, AND CONTROLS FSCAP.

Each Service applies the policies and procedures governing FSCAP in DOD 4140.1R. In comparing how each Service identifies, documents and controls FSCAP; each Service identifies FSCAP during the initial provisioning process, and adjusts their list of FSCAP based upon reports from the field. Each Service assigns a criticality code of “E” or “F” to the FSCAP and enters the FSCAP with the appropriate criticality Code into the FLIS. Each Service requires FSCAP to be tracked by serial number, and to be accompanied by historical records.

Each Service has adopted a policy for the identification and control of FSCAP/CSI modeled after DOD 4140.1R. AMCOM Regulation 702-7, Aviation Engineering Flight Safety Parts/New Source Testing Program management, paragraph 5e, DOD Flight Safety Critical Aircraft Parts (FSCAP) Program states "All logistical and other requirements of DOD Regulation 4140.1R, chapter 6.5, not cited in this regulation shall be complied with." [ref 22]

Draft #9 NAVAIRINST 4200.25D, Management of Critical Safety Items (CSIs), and Critical Application Items (CAI), paragraph 6a(3) states "All CSI shall be considered to be FSCAP IAW DOD 4140.1R" [ref 29].

The documentation and tracking procedures in Air Force Manual 23-110, volume 6, Chapter 10, Flight Safety Critical Aircraft Parts (FSCAP) program parallel DOD 4140.1R.

D. COMPARE/CONTRAST HOW EACH DOD MILITARY SERVICE QUALIFIES MANUFACTURERS AND TEST PARTS.

Delivery of safe reliable parts is a dominant concern for DOD, and the military Services. Each Service has established unique processes and procedures to accomplish this task. Qualification of manufacturers and vendors is at the heart of this issue.

The Army has a formal program that relies on qualified sources for the procurement of FSP. The Army allows breakout of FSP to manufacturers and vendors who pass the army qualification standards. The Army Qualifies contractors by reviewing their manufacturing process, quality procedures, and by testing all the critical characteristics

of the part, i.e., metallurgic, fatigue, stress, hardness, tolerance, etc. The part produced must pass engineering qualification testing, i.e., FAT for new manufacture, or PVA for O&M contracts. Contractors must meet quality standards of QE Std 1 or QE Std 2. QE STD 1 establishes minimum quality standards for manufacturers , and QE STD 2 establishes minimum quality standards for O&M of Army FSP. The Army requires Frozen process planning for FSP manufactures, and uses the SIOP and the FSP Program to monitor contractor performance. Through these processes the Army continuously performs surveillance visits and quality inspections of contractors' facilities, routinely monitors contractor performance, and performs conformance inspections and audits. This process reviews frozen process planning, assures compliance with FSP program requirements, documents findings and issues, and establishes dialog with manufacturers regarding FSP program and program requirements.

The Air Force does not have a formal program for the acquisition of FSCAP. The Air Force does not breakout FSCAP, the Air Force procures FSCAP from Prime contractors, the OEM, or OEM licensed vendors. The Air Force exerts extensive process control over the prime contractors to ensure the quality of FSCAP, but uses only limited production lot testing. [Ref 37]

The Navy has a formal program for CSI. The Navy limits potential new sources of CSI to those who have provided the same or similar items to the OEM or other military Services. The Navy has a 3-year rule, if a vendor has not produced a part in 3 years, they must be requalified. Prime contractors, and actual manufactures for the prime contractor that have quality plans approved by the government do not need to be

requalified, and CSI sources approved by other Services that have common parts with the Navy do not need to be requalified. Navy ESAs reevaluate alternate sources for CSI if there are concerns relating to product quality, manufacturing process changes, or they have not produced a part within three years of a proposed contract. The Navy uses FAT and extensive production lot testing to validate process control during production.

E. COMPARE/CONTRAST THE PROCEDURES USED TO RETIRE AND DISPOSE OF FSCP BY EACH SERVICE.

Each Service applies the FSCAP policy in DOD 4140.1R Chapter 6.5, DOD Flight Safety Critical Aircraft Part (FSCAP) Program. Each Service releases surplus FSCAP to the DRMO for Disposal, and FSCAP that have exceeded their useful life, or do not have historical records will be mutilated.

F. HOW DOES THE FAA INTERFACE WITH THE FSCAP PROGRAM?

The FAA is part of the Department of Transportation. The FAA and DOD coordinates policies that affect both Military and Civil Aviation. The FAA coordinates and communicates with DOD at the executive level[38] and at the working level[39].

[38] To resolve the issue of unsafe aviation parts being released to private industry the FAA was an equal member on a FSCAP Process Action Team (PAT). The FSCAP PAT consisted of members from FAA, Coast Guard, DOD, Army Navy, Air Force, and DLA, chaired by Mr. James R Klug, Deputy Under Secretary of Defense and Mr. Anthony J. Broderick, Associate Administrator, FAA.

[39] To implement the results of the PAT an implementation FSCAP team was formed consisting of the Office of the Secretary of Defense (OSD) chaired this team with representatives for the FAA, Coast Guard, Army, Navy, Air Force, and DLA

G. WHAT EFFECT WILL STANDARD DOD FSCP PRACTICES AND PROCEDURES HAVE ON THE FAA?

The Surplus Property Act of 1944 applies to all Services equally. The Surplus Act of 1944 requires DOD to dispose of excess military equipment. A standard DOD FSCP policy goes beyond just the tracking documenting, control, and disposal of FSCAP. A standard FSCP policy will impact the way DOD buys FSCP. At present each Service has unique engineering practices and procedures for the acquisition of FSCP. Aircraft parts are made to the exact specifications established by the Service's ESA and military parts that can fit on commercial equivalent aircraft might have qualification requirements that are not compatible with civil aviation requirements.

A single standard for the production of FSCP within the military will allow the FAA to determine the utility of a military part without having to research which Service procured the part, and which commercial/civil restriction should apply. A common standard will aid in the screening of parts compatible with civil aviation, and reduce the possibilities that incompatible parts will be released to private industry.

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V. CONCLUSIONS AND RECOMMENDATIONS

This chapter will document the conclusions reached, and provide recommendations to improve the DOD FSCP program.

A. OBJECTIVE

After studying DOD, Army, Air Force, and Navy FSCP policies and procedures, I was able to address the objective question of this thesis: What are the commonalities and differences in the procedures used by each Services to acquire, identify, qualify, and control FSCP, and how can the procedures be standardized to ensure ample control of FSCP collectively across all the Services within DOD? In general, there is no DOD policy or procedures for FSCP, however, there is a DOD policy for FSCAP that each Service follows.

B. CONCLUSION

- **FSCP is the acquisition of flight safety parts.**

  FSCP is a generic term used by DOD and the Services to cover the acquisition of flight safety parts, i.e., manufacture and post production of flight safety parts. Although each Service has a unique term and policy for the procurement of flight safety parts, DOD does not have a common term and policy. The term FSCP is used to cover the waterfront for the acquisition of FSCP when not being Service specific.

- **Using multiple terms for FSCP increases risk.**

  Each Service has their own policy, which contains a unique term for the acquisition of FSCP. The Army uses FSP, The Air Force uses EFSCAP, and FSCAP, the Navy uses CSI, and the JPPC uses EFSCAP, and there are subsets of each of these, i.e., CAI, FCI, DCP, etc.

DLA manages consumable and repairable FSCP for DOD. Each term has a quality level associated with it. Management of FSCP with multiple terms and quality requirements is difficult, and there is a risk associated with trying to satisfy many different engineering requirements for the same part.

- **There is no DOD qualification policy for FSCP.**

  DOD does not have a policy that contains vendor qualification, and quality standards to ensure the procurement of high quality, proven, reliable, and safe FSCP. DOD 4140.1R is generic and applies to all military parts (except C6.5 FSCAP program). DOD 4140.1R does not have the inspection criteria, or quality requirements needed to ensure the high standards required for FSCP. DOD does have a Policy for FSCAP, which is documented in DOD 4140.1R, C6.5. The policy for FSCAP deals exclusively with the identification, documentation, and disposal of FSCAP.

- **Each Service manages FSCP differently**

  Each Service manages the manufacture and post production of flight safety parts differently. The Army has a formal program that relies on qualified sources for the procurement of FSP. The Army allows breakout of FSP to manufacturers and vendors who pass the army qualification standards. The Army requires Frozen process planning for FSP manufactures, and uses the SIOP and the FSP Program to monitor contractor performance.

  The Air Force does not have a formal program for the acquisition of FSCP. The Air Force does not breakout FSCP. The Air Force procures FSCP from Prime contractors, the OEM, or OEM licensed vendors. The Air Force exerts extensive process control over the prime contractors to ensure the quality of FSCP, but uses only limited production lot testing.

  The Navy has a formal program for CSI management. The Navy limits potential new sources of CSI to those who have provided the same or similar items to the OEM or other military Services. If a vendor has not produced a part in 3 years, they must be requalified.

- **FSCAP is the identification, control, and disposal of flight safety parts.**

  The term FSCAP has a specific policy and definition tied to it. DOD 4140.1R, C6.5 FSCAP program address specifically the identification, control, and disposal requirements for FSCAP.

- **The DOD FSCAP policy is embraced by all three Services.**

  All three Services reference and apply DOD 4140.1R, Chapter 6.5 FSCAP program in their flight safety parts program. There are no changes needed.

C. RECOMMENDATIONS

- **Recommendation: Use the Term FSCAP to identify flight safety parts.**

  When referring to flight safety parts, which term do you use, FSCP, FSCAP, FSP, CSI? The term used for flight parts should give the vision of a reliable high quality part, not where on the lifecycle you are or what Service you are referring to. When referring to flight safety parts there should be one distinct term. A Common term with a common definition will eliminate confusion within the government and private industry, and one Term will unify the Services and support a common policy and definition.

  The term Flight Safety Critical Aircraft Parts (FSCAP) is already in the military system, i.e., Regulations, Publications, and government and contractor databases. FSCAP is descriptive of the intent of the flight safety parts program, i.e., the programs stress need for high quality in critical parts, and the program is specifically for aviation parts.

- **Recommendation: Use one definition and policy for flight safety parts.**

  A Common definition and policy for flight safety parts should be used to eliminate confusion within the government and private industry. The definition and policy for flight safety parts should cover the entire lifecycle, not just part of it. Although there are terminology differences between the Services, qualification methods and manufacturer approval processes are fundamentally the same. Each Service evaluates supplier technical data to ensure it is current,

correct, and complete. Each Service requires test articles to be submitted for engineering analysis to verify the item fully meets the approved design. Each Service reviews supplier manufacturing processes, quality system, and configuration controls to ensure the supplier can repeatedly produce acceptable and safe items.

- **Recommendation: Use one Quality standard for procuring flight safety parts.**

  A standard quality program will provide stable parts, and eliminate confusion when a vendor is producing a common part for all Services. Although there are differences between each Services' quality program they are fundamentally the same. Each Service evaluates supplier technical data to ensure it is current, correct, and complete. Each Service requires test articles be submitted for engineering analysis to verify the item fully meets the approved design. Each Service reviews supplier manufacturing processes, quality system, and configuration controls to ensure the supplier can repeatedly produce acceptable and safe items.

- **Recommendation: Develop one uniform DOD vendor qualification requirement.**

  One uniform DOD vendor qualification requirement will establish one DOD face to private industry, and eliminate multiple requirements when a vendor is producing a common part for all Services. Although there are differences between each Services vendor qualification requirements they are fundamentally the same. Each Service requires the manufacture to pass FAT, establish a quality program, and an inspection and testing program. Each Service exerts process control procedures on the manufacturer.

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DEFINITIONS

Critical Characteristic - Any feature throughout the life cycle of a FSCAP, such as dimension, tolerance, finish, material or assembly, manufacturing or inspection process, operation, field maintenance, or depot overhaul requirement that if non conforming, missing, or degraded may cause the failure or malfunction of the FSCAP.

Dual Use Product/Part - Any product or part manufactured for civil application by Production Approval Holder (PAH) authorized by the FAA, which is also procured under U. S. military contract. The product or part has the identical part number and configuration as its civil counterpart; it was manufactured using the same FAA-approved design, materials, and manufacturing processes. These could also include any product (or part thereof) originally produced for the military, which currently holds a normal, utility, acrobatic, or transport type certificate (TC) issued under section 21.27

Flight Safety Part - Any part, assembly, or installation containing a critical characteristic whose failure, malfunction, or absence could cause loss or serious damage to the aircraft, and/or serious injury or death to the occupants.

Installation Critical Characteristics - Critical characteristics that are not introduced during the manufacture of a part, but are critical in terms of assembly and/or installation, e.g., proper torque.

Manufacturing Critical Characteristics - Critical characteristics produced during the manufacturing process.

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